

# HISTORY OF NATTO AND ITS RELATIVES

(1405-2012):

EXTENSIVELY ANNOTATED

BIBLIOGRAPHY AND SOURCEBOOK

なつとう

納豆

Called Kinema in northeast Nepal, Thua-nao in Thailand, Aakhone, Bari, Bekang, Hawaijar, Peruyyan, Satlyangser, and Tungrymbai in northeast India, Sikkim and Bhutan, Pepok in Myanmar (Burma), Sieng in Cambodia, and Chungkokjang in Korea

Compiled

by

William Shurtleff & Akiko Aoyagi



2012

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History of Sieng  
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Chronology of Natto  
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Timeline of Natto  
Timeline of Kinema  
Timeline of Thua-nao

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## DEDICATION AND ACKNOWLEDGMENTS

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This book, no doubt and alas, has its share of errors. These, of course, are solely the responsibility of William Shurtleff.

■ This bibliography and sourcebook was written with the hope that someone will write a detailed and well-documented history of this subject.

## INTRODUCTION

### What is natto?

Natto is prepared (commercially or at home) by steaming soaked soybeans until they are soft, inoculating the warm (104°F) beans with the bacteria *Bacillus natto*, and then allowing them to ferment for 15 to 24 hours in a humid environment at about 104°F. The dark-brown beans have a fairly strong and unusual aroma and flavor, and a sticky, slightly slippery surface texture. When lifted from the bowl with chopsticks (fig. 13), like some varieties of melted cheese, they form gossamer-like threads. Although most whole soybeans are somewhat difficult to digest, natto are highly digestible because the beans' complex protein molecules have been broken down by the bacteria during fermentation. A whole, natural food, natto contains 16.5 percent protein and are rich in vitamins B-2, B-12, and iron.

### Brief chronology of natto and its relatives:

**1051-1083** – The origin of natto is obscure. According to legend, it was discovered accidentally in northeast Japan by Minamoto (Hachimantaro) Yoshiie when warm, cooked soybeans, placed in a rice-straw sack on the back of a horse, turned into natto. The warmth of the horse helped the fermentation.

**1405 Dec. 19** – Natto (*itohiki natto*) is first mentioned in the diary of Noritoki Fujiwara; it is called *itohiki daizu* (“stringy soybeans”).

**1450** – The word “natto,” referring to itohiki-natto, is next used in Japan in the *Shojin gyorui monogatari*. This is a funny story about foods that are depicted as people and a battle for rank between vegetarian and nonvegetarian foods. Natto, called “Natto Taro” or “Natto Taro Itogasane” (the last word meaning “many threads”) is given a high rank.

**1690** – The earliest known illustration of a person selling natto appears, along with the 2<sup>nd</sup> earliest known use of the term “itohiki natto.”

**1867** – The word “natto” first appears in English, in *A Japanese and English Dictionary*, by James C. Hepburn.

**1889** – “Mito-natto is first sold at Mito railway station in Mito, Ibaraki prefecture, Japan (Toyoda 1986).

**1894** – Dr. Kikuji Yabe (of Tokyo University, Japan) gives the earliest known scientific description of natto (first in German, then in English) and of how natto is made commercially. He isolated three *Micrococci* and one *Bacillus* from natto, but was unable to determine that those isolates were responsible for the natto fermentation. His

article, titled “On the vegetable cheese, natto,” is also the first to refer a natto as a “vegetable cheese,” a long-lived and unfortunate misnomer.

**1896** – In “Recent literature on the soja bean,” an article in the *American Journal of Pharmacy*, Henry Trimble is the first American to mention natto.

**1906 Aug.** – “On the microorganisms of natto,” by S. Sawamura published in a scientific journal in Japan. He found two bacteria in natto. He was the first to isolate *Bacillus natto* from natto, to give that name to the newly-discovered microorganism, and to show that it was responsible for the natto fermentation.

**1906** – Tung rymbai, a close relative of natto from Meghalaya in northeast India, is first mentioned by Singh in a Khasi-English dictionary. This is the earliest known relative of natto to be mentioned.

**1912** – The Taisho period (1912-1925) begins in Japan. As new railway lines expanded, linking natto's homeland in the northeast provinces with the capital at Tokyo, large-scale production and distribution increased – but so did the problems of temperature control, contamination, and product failure.

**1912** – Dr. Shinsuke Muramatsu of the Morioka College of Agriculture publishes “On the Preparation of Natto” in English. He found that three *Bacillus* species or strains produced fine natto with strong viscosity and good aroma at 45°C, but that *Bacillus* No. 1 produced the best product; he recommended its use as a pure culture. He concluded by giving the first nutritional analysis of fresh natto and of natto that was several days old. Soon Dr. Muramatsu started producing his “College Natto” at the College of Agriculture. His students helped to make and sell it, as a source of income, and it became very popular.

**1912** – The Natto Manufacturers Association of Tokyo is founded by six local natto makers.

**1919** – Dr. Jun Hanzawa, of Hokkaido University's Department of Agriculture, published the first of three key reports which helped to bring natto production in Japan out of the “Dark Ages.” Serving simultaneously as a microbiologist, and extension worker, and a pilot plant operator, Dr. Hanzawa began by making a pure-culture bacterial inoculum for natto; this enabled commercial natto manufacturers, for the first time, to discontinue the use of rice straw as a source of inoculum. Secondly, disliking the use of rice straw even as a wrapper, he developed a simple, low-cost method for

packing, incubating, and selling natto wrapped in paper-thin sheets of pine wood (*kyōgi*) or small boxes of pine veneer (*oribako*). A third important improvement followed shortly; the development of a new incubation room design (*bunka muro*), which had an air vent on the ceiling and substantially decreased the natto failure rate. These three developments laid the basis for modern industrial, sanitary, scientific natto manufacture. Commercial natto makers filled his classes and he worked as a consultant for them. Like Dr. Muramatsu before him, Dr. Hanzawa sold his “University Natto” from his research lab, promoting it as a rival to cheese. He was given the appellation of “the father of modern natto production.” In 1971 he was given the honor of addressing the emperor of Japan on the subject of natto.

**1926 Jan.** – The earliest known commercial natto is made in the United States by Nihon Miso Seizosho in Los Angeles, California. Other early commercial U.S. natto manufacturers were: 1930 – Higuchi Natto-ten, Los Angeles. 1937 – Yoneuchi Natto Seizo-sho, Los Angeles. 1939? – Harada Tofu, Zakka-ten, Fowler, California. 1951 – Kanai Nissei Shokai, Honolulu, Hawaii.

**1930 Jan. 8** – Dorsett and Morse, USDA plant explorers, collect three specimens and take a photo of “String Natto” in Tokyo, Japan. They are the first to use the word “string” (or “strings” or “stringy”) in connection with natto in English.

**1933 Nov.** – Carey D. Miller, in an article titled “Japanese foods commonly used in Hawaii,” says of natto: “The fermented product is covered with a gray, slimy substance that forms strings or threads when the beans are pulled apart, indicating good quality...”

**1947 April** – Auguste Chevalier, writing in French, notes that soybeans are used in West Africa to make *Soumbara* [also spelled *Soumbala* in later documents], a condiment normally prepared with the seeds of *Parkia* (the locust bean tree). In 1974 Kay (in Nigeria) states that *Sumbala* is made from soybeans instead of the usual *néré* seeds

**1952 Nov. 1** – Amaha and Sakaguchi, in a Japanese-language article, state that *Bacillus natto* is different from *Bacillus subtilis* in that the former requires the vitamin biotin for growth, whereas the latter does not. Kida et al. prove this even more conclusively in Nov. 1956.

**1954** – The Japanese National Natto Association (*Zenkoku Nattō Kyodo Kumiai Rengokai*) is formed, with headquarters in Tokyo – incorporating the 1912 association. Over the years it becomes an extremely effective organization, greatly benefitting its members and promoting natto nationwide.

**1961 June** – Shizuka Hayashi, gives the first statistics in

English on the natto industry and market in Japan. Managing director of the Japanese American Soybean Institute, he states that about 30,000 metric tons of whole soybeans are used in Japan to make natto.

**1963** – Bluebell R. Standal of the Dept. of Nutrition, Hawaii Agricultural Experiment Station, is the first Westerner to publish scientific research on natto (*J. of Nutrition*, Nov. p. 279-85).

**1963-1964** – In an article titled “Introduction of soybeans into Abuja [an Emirate in south central Nigeria], J.A. Yuwa writes (in the *Samaru Agricultural Newsletter*): “The Gwarrin Genge around Diko have discovered that soybeans can be used for making ‘Daddawa’ in place of the usual locust bean. The Koros around Ija pound it into powder and use it in place of melon seed to thicken their soup” This is the earliest English-language document seen that contains the word “Daddawa” in connection with soybeans, or states that soybeans are being used to make “Daddawa” in Africa. Soybean daddawa [dawadawa], it is a close relative of natto.

**1965 March** – Subtilisin, a strong proteolytic enzyme in natto, is first described by Matsubara. It was later found to be quite similar to nattokinase.

**1965 April** – The first “All-Japan ‘Natto’ Exhibition” is held in Japan, to promote consumer acceptability of natto and to rationalize the natto manufacturing process.

**1967** – Bekang, a close relative of natto from Mizoram, in northeast India, is first mentioned by Bose.

**1969 Nov.** – “Industrial production of soybean foods in Japan,” by Tokuji Watanabe (a paper presented to the United Nations Industrial Development Organization) is the earliest English-language document seen that uses the word “sticky” to describe natto.

**1970** – Thua-nao, a close relative of natto from northern Thailand, is first mentioned by Sundhagul et al.

**1971** – Korean-style natto (salted natto paste called *chungkookjang* / *ch’onggukchang*) is first mentioned by Park and Sung.

**1972** – The very important idea of the “natto triangle” is introduced by Japanese ethnologist Sasuke Nakao (*Ryori no Kigen*, p. 118-27). Within this big triangle in Asia, many relatives of Japanese natto are found. In 1962 he was first introduced to kinema in eastern Nepal.

**1972** – Herman Aihara, in *Miso & Tamari*, is the first to describe how to make natto at home in English.

**1975** – In *Natto Kenkosho (The Natto Way to Good Health)*, Teruo Ohta notes that natto is now packaged in polystyrene paper (PSP). This is also the earliest known document to mention *yukiwari-natto*, made in Japan by mixing itohiki natto with rice koji and salt, then aging the mixture. Or to mention *hikiwari natto*, made from cracked soybeans.

**1976** – “Kenima,” a misspelling of kinema, is first mentioned by Batra and Millner. “Kirima,” a misspelling of kinema, was first mentioned in 1978 by Hittle.

**1977 March** – An article titled “Isolation and characterization of four plasmids from *Bacillus subtilis*,” by Teruo Tanaka et al. in the *Journal of Bacteriology* is the first to mention plasmids in connection with *Bacillus subtilis* or with natto. Natto quickly becomes a major player in genetic research worldwide, and such research helps to unravel many of the mysteries of natto’s basic properties. A plasmid is a type of DNA which is separate from the chromosomal DNA and which is capable of replicating independently of the chromosomal DNA.

**1978 Oct.** – Charles Kendall, founder and owner of Kendall Food Co. (Brookline Village, Massachusetts) and a devotee of macrobiotics, is the earliest known Caucasian maker of commercial natto in the United States. He continued to make natto (as well as mochi and amazake) for more than 30 years.

**1980** – Hawaijar, a close relative of natto from Manipur, in northeast India, is first mentioned by Bilasini Devi et al.

**1982 April** – Martin Halsey, founder and owner of Soy Joy (Nyon, Switzerland), is the earliest known Caucasian maker of commercial natto in Europe. He is an American by birth.

**1982** – Kinema, a close relative of natto from eastern Nepal, is first mentioned by Park.

**1983 May** – An article by Toshio Hara et al. in the journal *Agricultural and Biological Chemistry* is the first to show the remarkable circular illustration of a plasmid.

**1985** – Akuni, a close relative of natto from Nagaland in northeast India, and Pe-bout, a close relative of natto from the Shan states of Burma, are both first mentioned by Martin – in the *Wall Street Journal!* He notes that ethnologist Shuji Yoshida of Osaka’s national museum has developed a “natto triangle” theory; he mentioned these foods in Japanese in connection with that theory. Akuni is now generally spelled “Aakhone.”

**1987 Oct.** – Nattokinase, a fibrinolytic enzyme in natto, is first mentioned by Sumi et al. Nattokinase was discovered

in 1980 by Dr. Hiroyuki Sumi while working at the Chicago University Medical School.

**1994** – Kinema (originally from eastern Nepal) is reported to be popular among the Lepchas who call it *Satlyangser* and among the Bhutias who call it *bari* (Sarkar, Tamang, Cook and Owens).

**2001 April** – An article by M. Kaneki et al. in the journal *Nutrition* is the first to point out that natto is one of the most concentrated sources of vitamin K-1 (MK-7). Conclusion: “... natto consumption may contribute to the relatively lower fracture risk in Japanese women.”

**2003 April** – An article by Kasahara and Kato, published in the prestigious journal *Nature* (London) confirms that PQQ (pyrroloquinoline quinone), a substance discovered in 1979, can be classified as a vitamin. More specifically, it is a new B vitamin, joining niacin / nicotinic acid (vitamin B-3) and riboflavin (vitamin B-2) – first new vitamin in 55 years. The most concentrated known source of PQQ is natto.

**2005** – Synonyms of kinema (originally from eastern Nepal) in nearby local languages are reported to be *Kinemba* (Limbu). *Hokuma* (Rai). *Bari* (Bhutia in Sikkim). *Satlyangser* (Lepcha in Sikkim).

**2008** – Sieng, a close relative of natto from Cambodia, is first reported by Tanaka. Interestingly, the name of the soybean in Cambodia has long been *sandek seng* (Brenier 1910; Petelot 1952).

**2009** – Peruyyan, a close relative of kinema from Arunachal in northeast India, is first reported by Tamang.

**2010** – Dr. Jyoti Tamang of Sikkim proposes a new “Kinema – Natto – Thua-nao triangle” (or KNT triangle) which is more complete and more accurate than the “natto triangle” proposed in 1972 by Dr. Sasuke Nakao.

#### **The many names natto / kinema and their relatives:**

aakhone  
aakhuni  
akhoni  
akhuni  
akuni  
axone  
bari  
bekang or bekang-um  
bekanthu  
bhari  
chuana

cheonggukjang or cheonggug-jang  
 ch'onggukchang  
 chongguk-jang  
 chongkukjang  
 chonkukjang  
 chungkok-jang or chung kok jang  
 chung kook jang or chungkookjang  
 chung-kook-jang or chungkook-jang  
 chungkukjang or chung kuk jang  
 hawaijar  
 hokuma  
 itohiki natto  
 joenkuk-jang  
 kenima  
 kinema  
 kinemba  
 kinima  
 kirima

なっとう

**natto - written in hiragana  
 (above) and in Japanese  
 characters / kanji (below)**

pe-bout or pe bout  
 pe-boutsu  
 pepok or pe-pok  
 pepoke or pe-poke  
 peruyyan  
 satlyangser  
 shui-tou-shi  
 shui-dou-chi  
 tooa-nao  
 tuanao or tua'nao  
 tao-nou  
 thua-nao  
 troombai  
 tungrymbai  
 turangbai  
 .....

**In West Africa, relatives of natto now  
 made from soybeans:**

dawa-dawa or dawadawa  
 dadawa  
 daddawa  
 iru  
 ogiri  
 soumbala  
 soumbara  
 soumbala  
 soydawadawa  
 néré or nèrè or nere  
 tonou

納豆

**ABOUT THIS BOOK**

This is the most comprehensive book ever published about the history of natto or its relatives. It has been compiled, one record at a time over a period of 35 years, in an attempt to document the history of this fermented soyfood. It is also the single most current and useful source of information on this subject.

This is one of more than 100 books compiled by William Shurtleff and Akiko Aoyagi, and published by the Soyinfo Center. It is based on historical principles, listing all known documents and commercial products in chronological order. It features detailed information on:

- 58 different document types, both published and unpublished.
- 1,783 published documents - extensively annotated bibliography. Every known publication on the subject in every language.
- 77 original Soyinfo Center interviews and overviews never before published.
- 145 unpublished archival documents.
- 50 commercial soy products.

Thus, it is a powerful tool for understanding the development of this subject from its earliest beginnings to the present.

Each bibliographic record in this book contains (in addition to the typical author, date, title, volume and pages information) the author's address, number of references cited, original title of all non-English language publications together with an English translation of the title, month and issue of publication, and the first author's first name (if given). For most books, we state if it is illustrated, whether or not it has an index, and the height in centimeters.

For commercial soy products (CSP), each record includes (if possible) the product name, date of introduction, manufacturer's name, address and phone number, and (in many cases) ingredients, weight, packaging and price, storage requirements, nutritional composition, and a description of the label. Sources of additional information on each product (such as advertisements, articles, patents, etc.) are also given.

A complete subject/geographical index is also included.



## ABBREVIATIONS USED IN THIS BOOK

A&M = Agricultural and Mechanical	mm = millimeter(s)
Agric. = Agricultural or Agriculture	N. = North
Agric. Exp. Station = Agricultural Experiment Station	No. = number or North
ARS = Agricultural Research Service	Nov. = November
ASA = American Soybean Association	Oct. = October
Assoc. = Association, Associate	oz = ounce(s)
Asst. = Assistant	p. = page(s)
Aug. = August	photo(s) = photograph(s)
Ave. = Avenue	P.O. Box = Post Office Box
Bld. = Boulevard	Prof. = Professor
bu = bushel(s)	psi = pounds per square inch
ca. = about (circa)	R&D = Research and Development
cc = cubic centimeter(s)	Rd. = Road
Chap. = Chapter	Rev. = Revised
cm = centimeter(s)	RPM = revolutions per minute
Co. = company	S. = South
Corp. = Corporation	SANA = Soyfoods Association of North America
Dec. = December	Sept. = September
Dep. or Dept. = Department	St. = Street
Depts. = Departments	tonnes = metric tons
Div. = Division	trans. = translator(s)
Dr. = Drive	Univ. = University
E. = East	USB = United Soybean Board
ed. = edition or editor	USDA = United States Department of Agriculture
e.g. = for example	Vol. = volume
Exp. = Experiment	V.P. = Vice President
Feb. = February	vs. = versus
fl oz = fluid ounce(s)	W. = West
ft = foot or feet	°C = degrees Celsius (Centigrade)
gm = gram(s)	°F = degrees Fahrenheit
ha = hectare(s)	> = greater than, more than
i.e. = in other words	< = less than
Inc. = Incorporated	
incl. = including	
Illust. = Illustrated or Illustration(s)	
Inst. = Institute	
J. = Journal	
J. of the American Oil Chemists' Soc. = Journal of the American Oil Chemists' Society	
Jan. = January	
kg = kilogram(s)	
km = kilometer(s)	
Lab. = Laboratory	
Labs. = Laboratories	
lb = pound(s)	
Ltd. = Limited	
mcg = microgram(s)	
mg = milligram(s)	
ml = milliliter(s)	

## HOW TO MAKE THE BEST USE OF THIS DIGITAL BOOK - SEARCH IT

**Most Important Thing:** The **KEY** to using this digital book, which is in PDF format, is to **SEARCH IT** using Adobe Acrobat Reader: For those few who do not have it, Google: **Acrobat Reader** - then select the **free** download for your type of computer. Then...

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When asked: “What word or phrase would you like to search for?” type that word or phrase in the box. For example: China or Rockefeller Foundation. No need to use quotation marks. Then click “Search.”

At “Results” click any line that interests you.

For those using a Mac without Acrobat Reader: Safari is often the default browser. Click “Edit” in the toolbar at top. In the dropdown click “Find,” then click “Find...” again. A search bar will open across top of screen with a search box at right. In this box type a word or phrase you would like to search, such as China or Rockefeller Foundation. Click “Done” then scroll through the various matches in the book.

**Chronological Order:** The publications and products in this book are listed with the earliest first and the most recent last. Within each year, references are sorted alphabetically by author. If you are interested in only current information, start reading at the back, just before the indexes.

**A Reference Book:** Like an encyclopedia or any other reference book, this work is meant to be searched first - to find exactly the information you are looking for - and then to be read.

**How to Use the Index:** A subject and country index is located at the back of this book. It will help you to go directly to the specific information that interests you. Browse through it briefly to familiarize yourself with its contents and format.

Each record in the book has been assigned a sequential number, starting with 1 for the first/earliest reference. It is this number, not the page number, to which the indexes refer. A publication will typically be listed in each index in more than one place, and major documents may have 30-40 subject index entries. Thus a publication about the nutritional

value of tofu and soymilk in India would be indexed under at least four headings in the subject and country index: Nutrition, Tofu, Soymilk, and Asia, South: India.

Note the extensive use of cross references to help you: e.g. “Bean curd. See Tofu.”

**Countries and States/Provinces:** Every record contains a country keyword. Most USA and Canadian records also contain a state or province keyword, indexed at “U.S. States” or “Canadian Provinces and Territories” respectively. All countries are indexed under their region or continent. Thus for Egypt, look under Africa: Egypt, and not under Egypt. For Brazil, see the entry at Latin America, South America: Brazil. For India, see Asia, South: India. For Australia see Oceania: Australia.

**Most Important Documents:** Look in the Index under “Important Documents -.”

**Organizations:** Many of the larger, more innovative, or pioneering soy-related companies appear in the subject index – companies like ADM / Archer Daniels Midland Co., AGP, Cargill, DuPont, Kikkoman, Monsanto, Tofutti, etc. Worldwide, we index many major soybean crushers, tofu makers, soymilk and soymilk equipment manufacturers, soyfoods companies with various products, Seventh-day Adventist food companies, soy protein makers (including pioneers), soy sauce manufacturers, soy ice cream, tempeh, soynut, soy flour companies, etc.

Other key organizations include Society for Acclimatization (from 1855 in France), American Soybean Association, National Oilseed/Soybean Processors Association, Research & Development Centers (Peoria, Cornell), Meals for Millions Foundation, and International Soybean Programs (INTSOY, AVRDC, IITA, International Inst. of Agriculture, and United Nations). Pioneer soy protein companies include Borden, Drackett, Glidden, Griffith Labs., Gunther, Laucks, Protein Technologies International, and Rich Products.

**Soyfoods:** Look under the most common name: Tofu, Miso, Soymilk, Soy Ice Cream, Soy Cheese, Soy Yogurt, Soy Flour, Green Vegetable Soybeans, or Whole Dry Soybeans. But note: Soy Proteins: Isolates, Soy Proteins: Textured Products, etc.

**Industrial (Non-Food) Uses of Soybeans:** Look under “Industrial Uses ...” for more than 17 subject headings.

**Pioneers - Individuals:** Laszlo Berczeller, Henry Ford, Friedrich Haberlandt, A.A. Horvath, Englebert Kaempfer, Mildred Lager, William Morse, etc. Soy-Related Movements: Soyfoods Movement, Vegetarianism, Health and Dietary Reform Movements (esp. 1830-1930s), Health Foods Movement (1920s-1960s), Animal Welfare/ Rights. These are indexed under the person's last name or movement name.

**Nutrition:** All subjects related to soybean nutrition (protein quality, minerals, antinutritional factors, etc.) are indexed under Nutrition, in one or more of 14 subcategories.

**Soybean Production:** All subjects related to growing, marketing, and trading soybeans are indexed under Soybean Production, e.g., Soybean Production: Nitrogen Fixation, or Soybean Production: Plant Protection, or Soybean Production: Variety Development.

**Other Special Index Headings:** Browsing through the subject index will show you many more interesting subject headings, such as Industry and Market Statistics, Information (incl. computers, databases, libraries), Standards, Bibliographies (works containing more than 50 references), and History (soy-related).

**Commercial Soy Products (CSP):** See "About This Book."

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**「みちのくの味」 雪割納豆**

雪割納豆の素朴な味は、おかわりしたくなる程のおいしさです。消化の悪い大豆の表皮をとり、北国特有の季候風土で納豆を造り、こうじ、食塩等を混ぜ長い期間かかって醗酵させますので普通の納豆と異って夏でも一ヶ月以上の保存にも耐えるわけです。

色素、合成添加物を一切使用していない自然食品なので安心してお子様からお年寄まで又御主人の晩酌のお相手としてきっと喜んで頂けます。

▷召しあがり方◁

1. 先ず調味してありますから醤油をかけずにそのまま少量ずつ炊きたての御飯にのせて召上り下さい。
2. 少量の大根おろし、きざみねぎ、わかび、辛子等の香辛料を添えると一層おいしくなります。(あま口の方は必ず大根おろしを混ぜして下さい)
3. 卵の黄味と混ぜ合せ七味唐辛子、花鰹を少量添えて酒の肴と致します。
4. 指ばちでよく振りつぶし、適量の水でうすめ、沸騰直前に新鮮な野菜をはなして召上り下さい体のあたたまる即席納豆汁が得られます。
5. 御飯の上に、もみ海苔と共にのせ熱い番茶をたっぷりかけて召上り下さい。おいしいお茶漬となります。
6. 少量の砂糖、バターを加え、よく振りつぶし、餅、パンにはさんで召上り下さい和製チーズとしてお子様にもよろこばれる風変わりなサンドイッチが出来上ります。

**\*雪割納豆は自然食品です\***

保存中ポリエチレン袋に白い斑点が付着する事がありますがこれは「チロシン」というアミノ酸の結晶体でカビではありませんので安心して召上り下さい。

尚、お気付の点は是非御連絡をお願い致します

**まるよね食品工業株式会社**  
 山形県米沢市窪田町窪田1040番2  
 電話 米沢23890002111~3

登録商標

**味付納豆**

**雪割納豆**

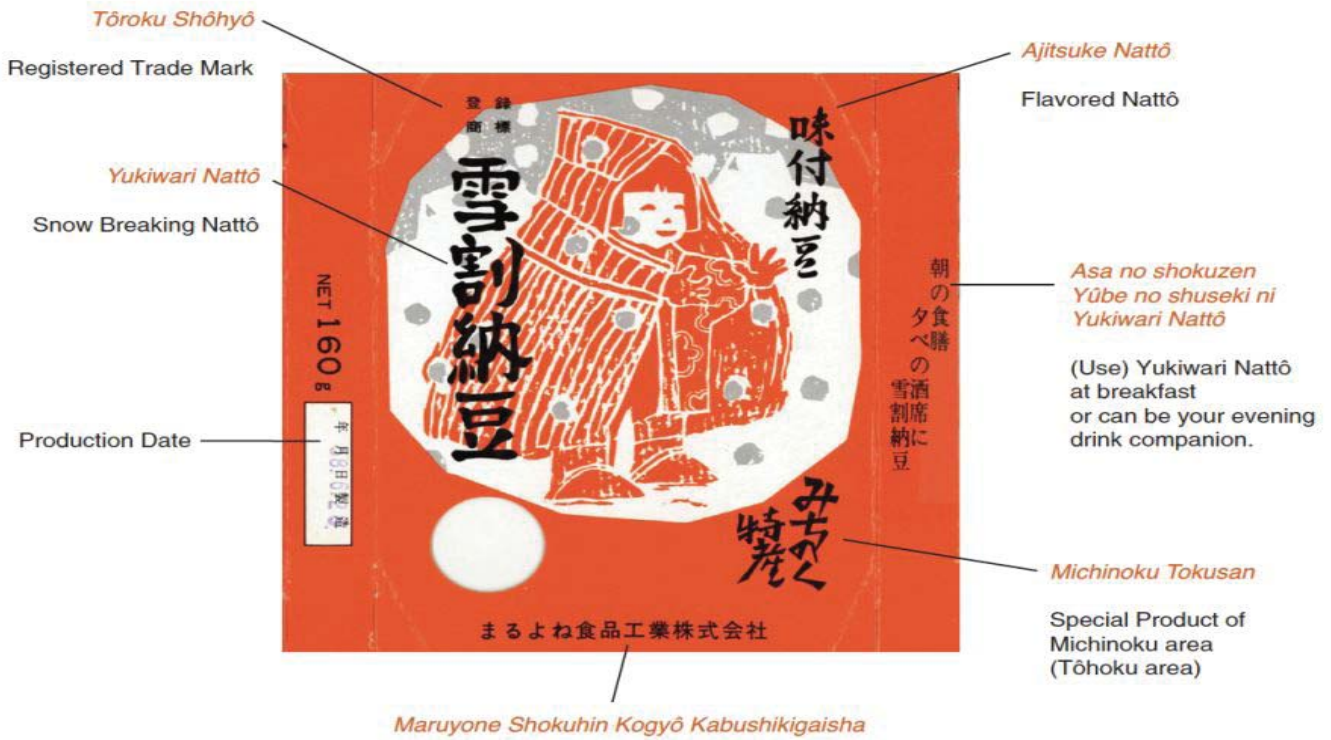
NET 160g

年月日製造

朝の食膳  
夕べの酒席に  
雪割納豆

**みちのく  
特産**

**まるよね食品工業株式会社**









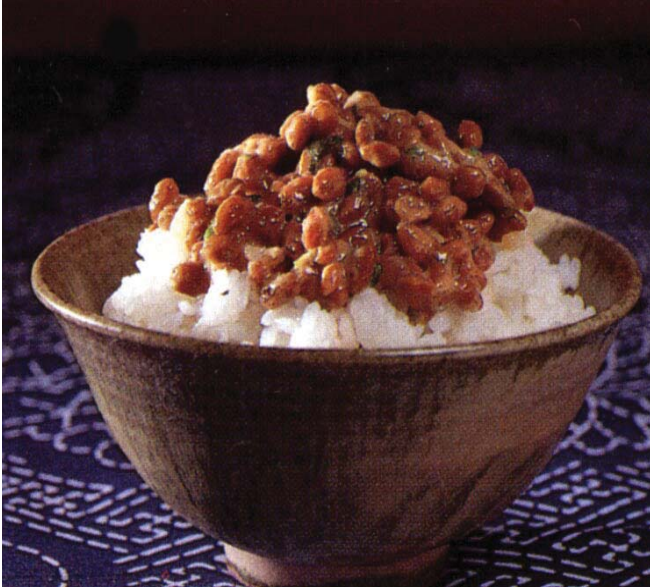
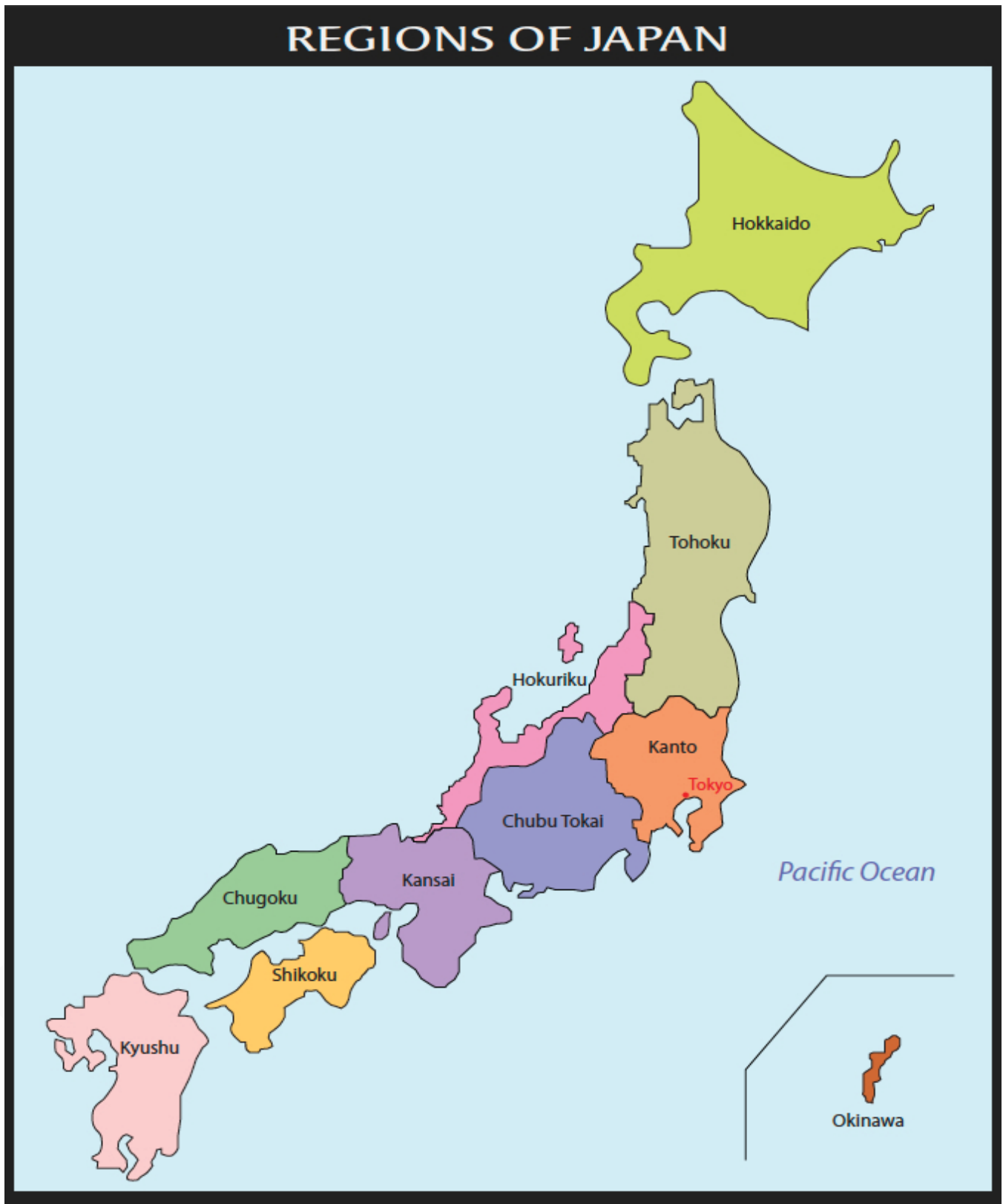


Photo: L.J.G. van der Maesen, Biosystematics Group, Wageningen UR

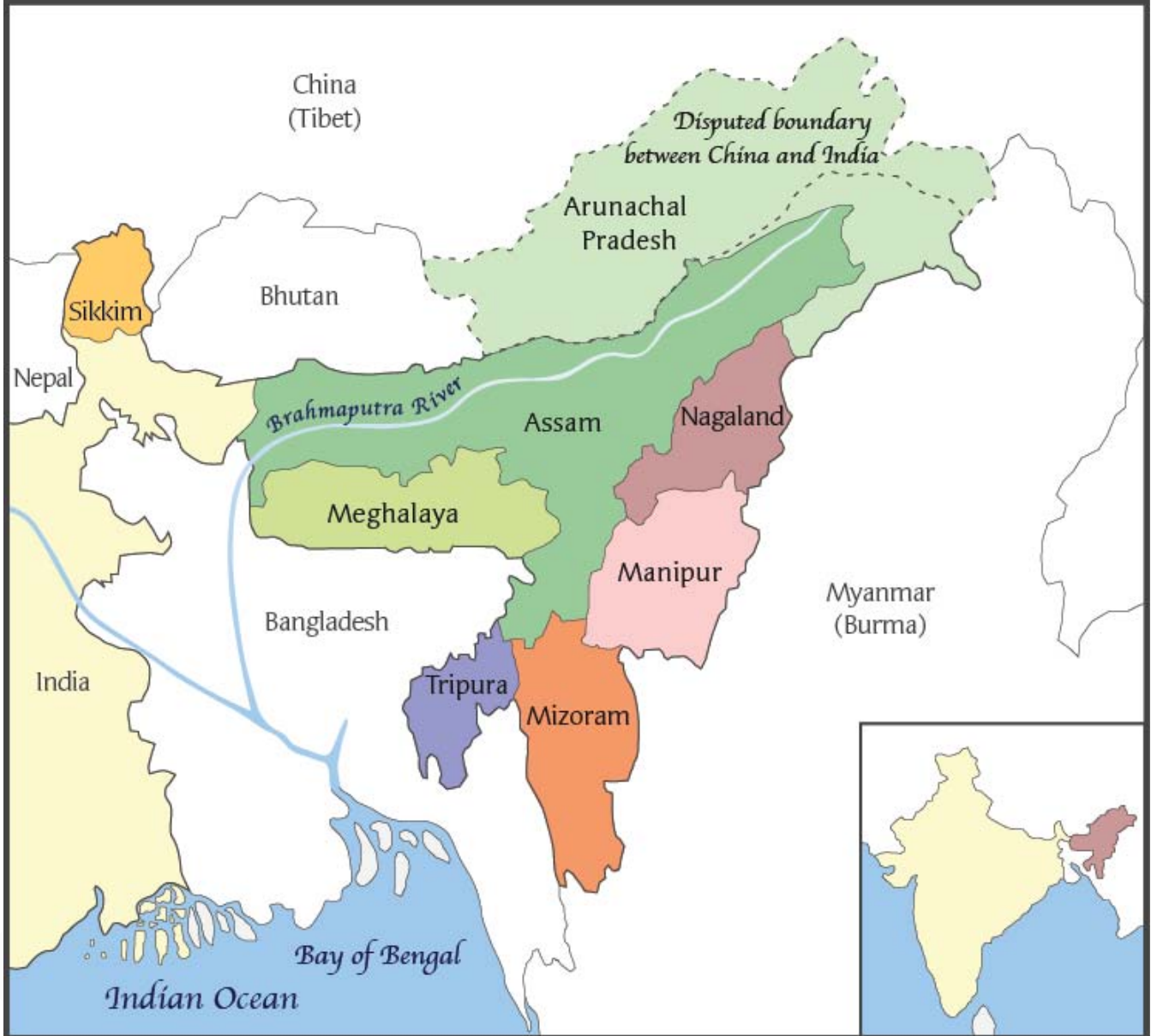
**DAWA-DAWA MADE IN WEST AFRICA  
FROM *PARKIA BIGLOBOSA* SEEDS**



## JAPAN'S NORTHERN PREFECTURES TÔHOKU CHIHO



## NORTH EAST INDIA (SEVEN SISTER STATES) PLUS SIKKIM



# HISTORY OF NATTO AND ITS RELATIVES

1. The legendary early discovery of natto in Japan by Hachiman-taro Yoshiie (Early event). 1051-1083.

• **Summary:** The origin of natto in Japan is obscure. This is the most famous legend of that origin.

In “Chronology of Soybeans,” by Akio Saito (1985. *Daizu Geppo (Soybean Monthly News)*. Jan. p. 12-14—in Japanese) we read: In the year A.D. 1083, stringy natto (*itohiki natto*) is discovered accidentally in Oshu (Oshū, northeast Japan) during the conquest of Oshu by Minamoto (Hachimantaro) Yoshiie (lived 1041-1108). It is said that the natto was made when cooked soybeans were placed in a [rice-straw] sack strapped over the back of a horse. The warmth of the horse helped the fermentation. There are so many legends like this one in the northeast prefectures (*Tohoku Chiho*) of Japan that it seems possible that natto was originally made there.

In the book *Nattō kenkō-hō [The natto way to good health]*, by Ohta Teruo (1975, Tokyo: Futaba Books. 242 p.—in Japanese) there is a chronology of natto. One page 223 we read under the year A.D. 1051: Hachimantaro Yoshiie’s natto legend started. *Oshū Kaido* became known as the “natto road.” More details and conjecture about the “Natto Road” are given on p. 37-39. Since ancient times, there have been many legends concerning the origin and development of natto. These legends are centered in Oshū, in the cold northeast provinces (*Tōhoku Chihō*) of Japan, which, in the eleventh century, was just north of the area controlled by the Japanese government. A man named Hachimantaro Yoshiie was the hero of two wars: The Zenkunen War of 1051 and the Gosannen War of 1083. When the weather was very cold, the crops were often poor. The government tried to collect taxes and the peasants threatened not to pay or to revolt. To apprehend those who refused taxes, and prevent the insurrection from spreading, the government sent in Minamoto no Yoriyoshi Yoshiie. Following the Oshu Road (*Oshū Kaido*) he led his soldiers and horses northward. The horses were fed cooked soybeans and straw. The war dragged on. The story goes that one night Yoshiie planned to attack the enemy. He made a camp and cooked soybeans but suddenly he was attacked, so he quickly put the cooked soybeans in a rice-straw bag (*tawara*), slung the bag over a horse’s back, and escaped. The next day, when the bag was opened, the soybeans—as if by magic—had turned to stringy natto—which had a distinctive fragrance and aroma. The four conditions necessary for making natto had been present: Cooked soybeans, rice straw, warmth, and moisture (heat and sweat from the horse’s body). The bacteria that caused the fermentation were found naturally on rice straw.

During the Gosannen war, the peasants who revolted were in Kiyohara. This time Yoshiie made the natto deliberately. A poet and popular figure who was respected

and intelligent, he recognized that natto was a good food—not simply spoiled soybeans. It made him and his soldiers feel strong. He considered it a portable “war food” that could be made with little effort while he was on a campaign.

Nagai and Tamang (2010, p. 194-95) retell the legend like this: “The most famous legend of the origin of *natto* is that of Yoshiie’s. In 1083, Hachiman-taro Yoshiie, the chief of a samurai legion, stayed at a house on the course of conquering the northern area of Japan. His retainer boiled soybeans for horses and wrapped the remaining soybeans with straws [sic]. The wrapped soybeans were fermented, after being tied to the back of a horse, that produced a viscous material on the soybeans. The retainer ate the soybeans and found it [sic] tasted very delicious. The fermented soybean food was *natto*.”

Note: Japanese natto scholars and historians find these legends interesting, but are quick to add that they are not supported by any documentary evidence. We have never been able to determine when this legend was first committed to writing.

2. The word *natto* first appears in Japan, but it refers to “salty natto” (*shio kara natto* [fermented black soybeans]) rather than to “sticky natto” (*itohiki natto*) (Early event). 1058-1068.

• **Summary:** Letter (e-mail) from Naomichi Ishige, Japanese food historian and expert on natto. 2008. Nov. 16. “The author of the book you asked about was Fujiwara Akihira, and its title was *Shin-sarugaku-ki* (in English: ‘New sarugaku story’). The book is supposed to have been written during 1058-1065.

“This is the first book which used the word *natto* to refer to ‘salty natto’ [fermented black soybeans]. However, salty natto itself has existed from ancient times in Japan; it was called *kuki*.”

Note: This is the earliest English-language document seen (Nov. 2011) that uses the term “salty natto” or the term “shio kara natto” to refer to fermented black soybeans.

“Concerning the origin of the word ‘natto’: According to the widely held theory, the character pronounced *na* originated from *nasso*, which refers to a temple’s kitchen. *To* means ‘beans.’ Monks ate lots of natto because they were (and still are) vegetarians. Thus *natto*, which means ‘beans of a temple’s kitchen,’ became used among people.”

3. Saito, Akio. 1292. [Chronology of soybeans, 122 B.C. to A.D. 1292] (Document part). In: Akio Saito. 1985. *Daizu Geppo (Soybean Monthly News)*. Jan. p. 12-14. [Jap; eng+]

• **Summary:** 122 B.C.—It is said that Lord Liu An of Huainan (*Wainan O Ryuan*) invented tofu. Therefore is sometimes called “Wainan.”

300 A.D.—By this time in Japan people are using fermented foods such as kuki, sake, vinegar, sushi, and hishio made from herbs (*kusa-bishio*) and grains (*koku-bishio*). Kuki is a bean-based product related to miso, natto, or tamari.

630 A.D.—Igunami no Otasuki is sent as a student from Japan to T'ang dynasty China (*Kentoshi*). It is thought that foods like tofu were brought back to Japan by such student monks when they returned [but there are no records of this].

701 A.D.—The Taiho Law Codes (*Taiho Ritsuryo*) are established, and they call for the establishment of the Hishio Tsukasa (Bureau for the Regulation of Production, Trade, and Taxation of Hishio and Misho), located in the Imperial Palace as an annex to the emperor's kitchen (*daizenshoku*). Soybeans were definitely used to make these fermented foods and seasonings such as hishio (like Chinese chiang), fermented black soybeans (*shi, kuki*), and misho (a forerunner of miso; the term “miso” had not yet been coined).

741 A.D.—Two new Buddhist temples are added to each feudal domain (*kuni*): Kokubunji is for monks and Kokubuniji is for nuns. It is said that from this time, fermented black soybeans (*tera nattô*, or *shiokara nattô*) spread throughout Japan. They are made from soybean koji, which is soaked in salted water and dried.

794—The capital of Japan is relocated to Kyoto from Nara. The Heian period (794-857) begins.

794-1190—Salted pickles (*shio-zuke*), hishio pickles (*hishio-zuke*), miso pickles (*miso-zuke*), and sake lees pickles (*kasu-zuke*) are eaten. The pickles were made by various methods. But only during and after the Muromachi period (1338-1573) were the various pickles made often.

802—Sakanoue no Tamuramaro (758-811) recommends that farmers in Tanzawa grow soybeans as an emergency food.

840—Each feudal domain (*kuni*) is encouraged to plant millet, barnyard millet, barley, wheat, soybeans, azuki beans, and sesame seeds.

901—The Chinese character *so* in the present word *miso* appears for the first time in the *Sandai Jitsuroku*.

927—The *Engishiki* is completed by Fujiwara no Tokihira (871-811) and others. In this book it is written: “In the feudal domain of Omi 60 koku of soybeans [1 koku = 47.6 gallons or 180 liters], in the domain of Tanba 30 koku, in the domain of Harima 20 koku, in the domain of Misa 10 koku, and in the domain of Iyo 10 koku are recommended (*susumu*). It seems that the soybean was an important crop in those days. Soybeans, rice, wheat, sake, and salt are given as the raw materials for making misho (a product resembling miso). The places famous for making misho are Omi, Hida, Yamato, etc. There are 27 misho shops in the Nishi no Kyo area of Kyoto. It is stated in the *Engishiki* that in order to make 1.5 koku of hishio you need 3 koku of soybeans, 1.5 koku of salt, 0.15 koku each of rice, wheat, and sake, and 0.043 koku of non-

glutinous rice (*uruchi-mai*). Hishio at that time would seem to resemble today's kidamari; it would seem to have been very salty.

1068?—Salty natto (*shiokara nattô*; probably fermented black soybeans) appears for the first time in the book *Shin Sarugakki*, by Fujiwara no Akihira (lived 989-1066). In this book the lifestyle, manners, and customs of the time are described.

1083—Stringy natto (*itohiki nattô*) is discovered accidentally in Oshu (northeast Japan) during the conquest of Oshu by Minamoto (Hachimantaro) Yoshiie (lived 1041-1108). It is said that the natto was made when cooked soybeans were placed in a sack strapped over the back of a horse. The warmth of the horse caused the fermentation. There are so many legends like this on in the northeast prefectures (*Tohoku Chiho*) of Japan that it seems possible that natto was originally made there.

1183—Tofu is first mentioned in a document from the Great Kasuga Shrine (*Kasuga Taisha*) in Nara. The characters used to write the word tofu then were different from the characters used today. It seems that this tofu was very hard.

Note: See Diary of Hiroshige NAKAOMI, entry of 1183.

1192—The Kamakura period and shogunate begins as Minamoto no Yoritomo (1147-1199) becomes the first head shogun.

1228—The Buddhist monk Kakushin returns to Japan from Sung dynasty China having learned the method for making fermented Kinzanji miso. While fermenting the miso in Japan, he discovers that the liquid which gathers on the bottom of the vats can be used as a tasty seasoning. This tamari is considered the first soy sauce in Japan. Kinzanji miso is a type of *namémiso* (Finger Lickin' Miso) made from roasted soybeans and barley koji. To these are added eggplant, white melon (*shiro uri*), etc., and the mixture is fermented.

1288-1292—Tamari-style shoyu is sold from Yuasa in the Kishu area (in today's Wakayama prefecture).

Note 1. This document contains the earliest clear date seen for the cultivation of soybeans in Japan (A.D. 802, and 840), and for the appearance of the term “tamari” in Japan (1228).

Note 2. This is the earliest document seen (Sept. 2000) that mentions sesame seeds (802 A.D.). Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

4. Fujiwara Noritoki. 1405. Noritoki-kyô ki [Diary of the nobleman Noritoki FUJIWARA]. Entry of Dec. 19. Japanese summary by Kawakami 1978, p. 225-26. [Jap]

• **Summary:** Kawakami (1978) in his one-page summary of this work (which contains 3 volumes (*satsu*), 783 pages) makes no mention of natto. He does say, however, that this book discusses *shiro-zake* (white sake).



However Kawakami and Kimura (1985) state that this diary contains the earliest known reference to natto. They state: What we now call natto (*itohiki-nattô*) was written as *itohiki daizu* (“string-pulling soybeans”) in the old days. It was written like that in the entry for 19 Dec. 1405 in the *Noritoki-kyo ki* (*Diary of Noritoki Fujiwara*), which is the earliest document seen (Jan. 2012) that mentions natto. The author’s name was FUJIWARA Noritoki, but he was usually called Yamashina Noritoki because this nobleman’s family, which lived on land they owned in Yamashina near Kyoto, kept their diary for five generations. This Yamashina family was in charge of the supplies department for the Imperial Court (*Chotei*), and all supplies that went to the Court had to pass through this family, which recorded them in detail. Another diary was kept by the family’s manager (*banto*), and it is even more detailed, containing all of the prices of the goods ordered, and including wages paid to laborers, carpenters, etc. Therefore it is also a very useful book.

Letter (e-mail) from Naomichi Ishige, Japanese natto expert. 2007. March 20. This photocopy is from the late Kozo Kawakami (1995, p. 21). The large section on *itohiki nattô* states that the second earliest known appearance of this food is found in the *Noritoki kyo-ki*, which mentions *itohiki-daizu* (“string-pulling soybeans”) in the entry for 19 Dec. 1405. This diary was written by TAMASHINA Noritoki, who was an aristocrat.

Note 1. This is the earliest document seen (Jan. 2012) that mentions natto (*itohiki nattô*), which it calls *itohiki daizu*.

Note 2. This is the earliest Japanese-language document seen (Dec. 2011) that uses the term *itohiki daizu* to refer to natto.

Note 3. Kozo Kawakami was born in 1898. Address: Japan.

5. Nijo, Yoshimoto. 1450. *Shôjin gyorui monogatari Shôjin gyorui monogatari* [A comic tale of the great war between vegetarian foods and animal foods]. Japan. 79 p. Japanese summary by Kawakami 1978. [Jap]

• **Summary:** Some say that the author was Yoshimoto NIJO (lived 1320-88), but Kawakami thinks that the work was more likely written a little later, in the mid-Muromachi period (the period ran from 1338 to 1573). The original handwritten copy has been lost but the published copy (79 pages) still exists.

This is a funny story about foods that are depicted as people. There are different fish people, Suri-dofu (grated tofu), Natto Taro (or Natto Taro Itogasane; the last name means “many threads”), etc. The story explains that vegetarian foods and fishes got together at the high ranking samurai’s place. A red snapper that showed up late was placed at a lower ranking seat below the vegetarian foods. Natto Taro was placed next to the top samurai. The red snapper got upset and called on the fish, shellfish, poultry,

and meats to attack the vegetarian (*shojin*) foods. Some animal names weren’t even foods.

Letter from Naomichi Ishige, Japanese natto expert. 2007. Jan. 17. This monogatari contains the 2nd earliest known reliable reference to natto in Japan.

Note 1. This is the 2nd earliest document seen (Jan. 2012) and the 2nd earliest reliable Japanese-language document seen that mentions natto. This is also the 2nd earliest document seen (Dec. 2011) concerning the etymology of natto. For more details see: M. Hirano. 1990. *Nattô bunka-kô* [Thoughts on the culture and history of natto]. *Shoku no Kagaku (Food Science Journal)* No. 144. p. 16-22 (see p. 21).

Note: This is the earliest document seen (July 2002) concerning soyfoods and vegetarianism in Japan.

6. Nôin Eshun. 1568. *Tamon-in nikki* [Tamon-in diary]. Nara, Japan. See entry for May 21. English-language summary by Kodama & Yoshizawa 1977, p. 427. Japanese summary by Kawakami 1978, p. 222. [Jap; eng]

• **Summary:** This diary was kept from about 1539 to 1596 (58 years) at the Tamon-in monastery inside the Kofuku-ji temple in Nara City, Japan.

Letter (e-mail) from Naomichi Ishige, Japanese natto expert. 2007. March 30. The entry for 21 May 1568 mentions *netaru-natto*. The entry was written by Nôin Eshun, who was the chief priest at Tamon-in, a monastery that belonged to Kofuku-ji in Nara. Kawakami et al. (1978) understood *netaru natto* to mean what we now call *itohiki natto*.

Note 1. This is the earliest Japanese-language document seen (Jan. 2012) that uses the term *netaru natto* to refer to natto.

This diary also describes in detail a heating method to kill the microorganisms in saké (Japanese rice wine). It was almost identical with the process invented by Pasteur in France in 1865 (300 years later) for low-temperature pasteurization of wine and milk. This work does not mention soy sauce, but the Japanese process was later used on soy sauce.

Iino (2003, p. 9): In this diary shoyu made from a second pressing of the moromi (*niban shoyu*) is referred to as *tou-miso niban* (second tou-miso) and its production is discussed. This can be seen in several places, including the entry for the date of the 17th year of Tenmon (1548) Jan. 1.

7. Companhia de Jesus [Society of Jesus (Jesuit)]. 1603. *Vocabulario da lingua de Iapam, com a declaração em Portugues, feito por alguns padres, eirmaôs da Companhia de Iesu* [Vocabulary of the language of Japan, with definitions in Portuguese, produced by some fathers and brothers of the Society of Jesus]. Nagasaki, Japan. 403 p. [Por; Jap]

• **Summary:** At the bottom of the title page is written: “Com licença do ordinario, & Superiores em Nangasaqui no Collegio de Iapam da Companhia de Iesus. Anno M.D. CIII.”

The “Licença” or license by Francisco Pasio is dated 2 Jan. 1603. A romanized version of each Japanese word is given, followed by a brief explanation in Portuguese. In Japanese, this book is known as *Nippo Jisho, Nagasaki-ban*. In 1960, Iwanami Shoten published a facsimile edition in Japan, titled *Nippo Jisho: Vocabulario da lingoa de Iapam*, compiled by Tadao Doi (822 p., 22 cm), then in 1980 they published a Japanese translation (xxxiv + 862 p., 27 cm). Kawakami (1978) has summarized some soy-related portions. Iwai (1953, p. 11) notes that this dictionary was compiled by Joao Rodrigues—but this is controversial.

Soy-related terms in this dictionary, and a translation of their definitions from Portuguese, through Japanese, into English, are as follows:

Abura ague. 1. Abura agueno mono. Abura-agé [deep-fried tofu] or abura-agé mono. Things which are deep-fried in oil. Note 1. This is the earliest document seen (April 2001) that mentions fried tofu.

Aburidôfu. Slice tofu, which is made from beans like raw cheese, broil in a fire.

Amazaque [Amazake], a still-bubbling fermented liquid that has not yet completely become sake; or sweet sake. Note 2. This is the earliest Portuguese-language document seen that mentions amazake, which it calls “Amazaque.”

Azzuqi or azzuqui [azuki beans]. “*Hus feijoes pequenos como lentilhas*” means “Beans that resemble green peas (endo). Azzuqigai is rice porridge (o-kayu) that contains azuki beans. Azzukimochi is mochi that contains azuki beans. Note 3. This is the earliest European-language document or Portuguese-language document seen (Jan. 2005) that mentions azuki beans, which it calls *Azzuqi* or *Azzuqui*.”

Cabe [Kabe]. Same as tofu. A type of food which is made from ground beans. This is a woman’s word. Note 4. This is the earliest document seen (Feb. 2004) that uses the word “cabe” (or “kabe”) to refer to tofu.

Côji [Koji], a yeast used in Japan to make sake, or mixed with other things. Note 5. This is the earliest European-language document seen (July 2000) that mentions the word for koji.

Daizzu [Daizu]. Mame. Graos, ou feijoes de Iapao [grain, seed, kernel, or Japanese beans].

Dengacu [Dengaku]. Dancing monks (Bôzos). Or tofu which is skewered, and on top of each slice is spread miso; then it is broiled.

Fanben [Hanben]. A type of food which is made by broiling tofu and simmering it with miso.

Ichhō. A way of counting some types of food, such as tofu.

Miso. A kind of mixture which is made with *graos* [grains, seeds, kernels], rice, and salt to season Japanese soups.

Note 6. This is the earliest European-language (or Portuguese-language) document seen (March 2009) that

mentions miso, which it calls *Miso*.

Misocoxi [*Misokoshi*], a bamboo strainer used for straining miso. Note 7. This is the earliest document seen (March 2011) that mentions a *misokoshi*.

Misoya, a shop that sells miso.

Misoyaqijiru [*Miso-yaki-jiru*], a type of soup (*Xiru*) made with tofu and finely sliced daikon radish. Note that the word tofu was written as “Tofus” in the dictionary but should be written “Tôfus.”

Misôzzu, which should properly be called Zosui, is a healing food made from vegetables, rice, miso, etc. and served to those who are old, weak, or sick. Another meaning of this term is a type of porridge [*kayu*] containing a mixture of rice, vegetables, and other things.

Nattô, a type of food made by a brief boiling of grains / seeds [*graos* is the word used, but soybeans are actually employed], which are then put into an incubation chamber (muro).

Nattôjiru, a soup (*Xiru*) made from natto. Note 8. This is the earliest Portuguese-language document seen (Jan. 2012) that mentions *natto* or *Nattôjiru*. However recall that the “natto” used in *Nattôjiru* may well be fermented black soybeans.

Saque (sake, saké).

Tamari, a very savory liquid taken from miso which can be used for seasoning foods [when cooking] or at table. Note 9. This is the earliest document seen (Feb. 2005) that mentions tamari.

Tôfu\*–Taufu. A type of food. It is made into the shape of a cheese by crushing soybeans. \* Note: The sound of the Japanese character for bean (mame) is “tou.” But at that time “taufu” was the typical pronunciation. In other documents it is the same, for example the *Iitsugu Kyoki* (Iitsugu Diary) written during the Tensho period (1573-1586), with entries in 1588, 1591, and 1600. Sometimes they used the characters for “T’ang” (as T’ang dynasty in China) and “cloth,” although they were also pronounced as “taufu.” In this 1603 Portuguese dictionary there appear a number of tofu terms written in the “open sound form” (kaionke): Cabe [Kabe = wall], Dengacu [Dengaku], Fanben, Ichhō [One cho or cake of tofu], Vdondôfu, and Yudofu. One exception is the term Aburidôfu.

Tôfuya–Taufuya, a shop which makes and sells that cheese-like thing (tofu), which is made by grinding soybeans that have been soaked in water until they are soft.

Vdondôfu [Udon-dôfu]. Tofu which is made like udon (Japanese-style wheat noodles) and cooked.

Xôyu [Shoyu, or soy sauce], a liquid which corresponds to vinegar except that it is salty. It is used for seasoning foods. It is also called *sutate*. The character *su* means “bamboo mat” [as in “sudare”] and the character *taté* means “to stand up.” Note 10. This is the earliest Portuguese-language document seen (July 2006) that mentions shoyu or soy sauce, which it calls *Xôyu*.

Yudôfu–Yudaufu: A food made from thinly sliced tofu, served next to a *kakejiru*-type sauce [which is then poured over the top].

The following terms are not mentioned: Agé (but *abura-agé* is), Daitokuji natto, Edamame (or Eda mame or Yeda mame), Fu (or gluten or wheat gluten), Hamanatto or Hamana-natto, Hiya-yakko, Kinako, Koya-dofu (or Kori-dofu), Okara, Soj\*, Soj\*, Shoyu, Tonyu, Unohana, Yaki-dofu, Yuba, Zoy\*.

Note 11. This is the earliest dictionary of the Japanese language compiled by Europeans. It is also the earliest document seen (Feb. 2001) concerning soybeans or soybean products in connection with (but not yet in) Europe or Portugal, and the first such document to mention miso or natto.

Note 12. This is the earliest European-language (or Portuguese-language) document seen that mentions tofu, which it calls *Cabe*, *Tôfu*, or *Taufu*.

Michael Cooper (1974, p. 222-23), in his excellent biography of Rodrigues, states that in the preface to this celebrated work, the “compilers promised to produce shortly a supplement containing additional terms and words inadvertently admitted from the dictionary. The supplement appeared the following year, and the Bodleian Library, Oxford, possesses a copy of both the *Vocabulario* and its supplement bound together in one volume. The dictionary runs a formidable total of 330 folios, while the supplement extends to 71 more folios, each page carrying two columns of text. The value of this great dictionary, containing a total of 32,798 entries, is considerable.” “Whether or not Joao Rodrigues had a hand in the compilation of the *Vocabulario* is still a debatable point... Thus until further evidence appears, the identity of the principal European collaborators must remain conjectural.” Address: Nagasaki College of Japan.

8. Yorozu kikigaki hidden [Secrets of things heard and written]. 1650. Japan: Publisher unknown. 102 p. 2 volumes. Japanese summary by Kawakami 1978, p. 158. [Jap]

• **Summary:** Within the 54 sections, 34 sections concern food preparation, preservation, etc. Includes how to make shoyu, natto, dried-frozen tofu (*kori-dofu*), and miso. Between 1650-1673, nine printings were made. Each successive publication became more compact and more popular.

9. Nattô monogatari [The story of natto]. 1650? Japan. [Jap]\*

• **Summary:** Contains a recipe for Natto Miso Soup (*Nattô Jiru*).

Note: Recall that this *Natto Jiru* may well be made with fermented black soybeans rather than *itohiki* natto.

10. Gôruï nichiyô ryôri-sho (or ryôri shinan-sho) [The recipe book with mixed variety for daily use]. 1689. Nishimura Hanbei (Edo), Nishimura Nishimura Ichiroemon and

Nakagawa Moheibeï (Kyoto). 5 volumes. Japanese summary by Kawakami 1978. [Jap]

• **Summary:** Other names for this book are *Gorui Nichiyô Ryôri Shinan-sho*, *Ryôri Shinan-sho*, and *Ryôri-sho*. The author is unknown. Fermented foods (*jozo shokuhin*) are included in volume 1, and tofu in volume 3. Unlike a typical recipe book, this one contains many descriptions of methods and processes for making foods. The book also contains detailed recipes for making and serving natto, plus a history of natto.

11. Jinrin kinmô zui [Illustrated encyclopedia of life in the Edo period]. 1690. Kyoto, Japan. Reprinted in 1990 by Heibonsha (Tokyo); edited by Asakura, Haruhiko. [Jap]

• **Summary:** The following page numbers refer to the 1990 reprint edition published in Tokyo by Heibonsha. The compiler of this remarkable work is unknown. At the bottom of almost every page (up to p. 293) are one or two half-page illustrations. Pages 317-31 are footnotes, followed by a syllabary index (a e u e o, ka ki ku ke ko).

The original edition was divided into seven volumes, including: 2. Noh drama. 3. Producers (farmers, woodcutters, fishermen, etc.). 4. Merchants (sellers). 5. Craftspeople. 6. Various and other jobs. 7. Entertainers. At the end is a long section of footnotes and annotations.

Page 121. The illustration is titled *Kuzune-hori* (Digging kuzu root). Yoshino kuzu is the best known in Japan.

Page 142. Shoyu is a famous product of Sakai. Produced in Osaka and Sakai, it is shipped to various places (no illustration).

Page 144. The right illustration is titled *Koji-shi* (Koji maker). Miso makers, manju (steamed bun) makers, and many others use koji. The illustration shows a man carrying four koji trays (*koji-bune*) filled with koji; he is about to put them into the incubation room (*muro*, which has a rounded top) where the koji will ferment. The text mentions a “thin board” (*usuita*), which may be a second type of koji tray, shown on the ground at right, lacking either one or both ends. The volume of koji is measured by the standardized size of the koji tray.

Page 144. The left illustration is titled *Miso-ya* (Miso shop). It shows two men mixing or pounding something (either koji, cooked soybeans and water before fermentation, or miso after fermentation) in a wooden mortar (*usu*, *suribachi*) using long wooden spatulas or pestles. They use a wooden spatula (*sekkai*) as their store sign. Behind the men to the left is a vat of fermenting miso with stones on top for pressure. Two wooden scoops in a rectangular wooden “boat” are used for scooping and measuring koji, cooked soybeans, and/or salt. The text says: “Miso makes a good seasoning and helps keep people healthy. A day cannot go by without it.”

Page 152. The illustration, titled *Kome-ya* (Rice shop), shows a man unloading a bale of rice (wrapped in rice

straw) from the back of his horse. Nearby is a rice merchant, standing on a low platform near two other bales of rice. The text notes that the shop sells the “five grains” (*go-koku*), which include soybeans (*daizu*).

Page 160. The left illustration, titled *Yakidofu-shi* (Grilled tofu man), shows a man making grilled tofu over a rectangular brazier. In his right hand is a fan, with which he fans the coals beneath several cakes of tofu. In his left hand is a skewer with two prongs that pierce a cake of tofu. In front of his brazier is a wooden pail, which may be used to store cakes of tofu in water. At the front left is a sloping tray on which slices of tofu are drained. The maker of grilled tofu can be found in market places, temple gatherings, festivals, and wherever people gather around. Note: This is the earliest Japanese-language document seen (Feb. 2010) that mentions grilled tofu, which it calls *yaki-dōfu*.

Page 162. The illustration, titled *Ko-ya* (Flour shop), shows three people turning a large hand-turned stone mill in which various types of flour (including soy flour, *daizu no ko*, which is probably roasted soy flour {*kinako*}) are ground. Ropes from the ceiling hold up the t-shaped end of a push-pull device used to help turn the heavy upper stone.

Page 166. The right half of the illustration (not shown)



is titled *Seller of Tataki natto in Kyoto*. To make this natto, dice stringy (*itohiki*) natto finely, then shape into a thin, flat square. Mix in finely chopped greens and tofu. It is an inexpensive, fast food. It is sold by walking street vendors from the end of September until February, especially at Tomikoji-dori, Shijo-agaru machi (probably in Kyoto).

The other illustration shows two men in front of a shop. Each is carrying a shoulder pole on one shoulder; from each end are suspended containers used to hold food. Each is also wearing straw sandals (*waraji*). The man on the right carries containers that are shaped like boxes with the long edges oriented vertically. A sliding panel may be used to open each box. Inside are either utensils and the ingredients for making tatakhi-natto, or bowls of tatakhi-natto ready to eat.



Note: This is the earliest document seen (Jan. 2012) that contains the word *itohiki* or the term “Tataki natto” in connection with natto,

Page 225. The left half of the illustration is titled *Horo miso*, which is a kind of miso. The character for *Ho* means “law” or “dharma.” The man on the left has cylindrical wooden containers (*magemono*, shaped like traditional Japanese steamers) suspended from each end of his shoulder pole. Atop each is a bamboo mat (*sudaré*). The text states: This miso is made with black soybeans (*kuro mame*). The men who sell it all wear orange robes dyed with persimmons. They never put down the merchandise. Its container was covered and they carried it using a shoulder pole to keep it clean. When they had to put it down, they placed it with one side leaning against something. If anyone stepped over it, the seller demanded that that person buy it. To make *horo miso*, cook black soybeans, then drain off and squeeze out the liquid. The result is a very firm miso with a low water content. Originally it was used in temples, but later it came to be used by the common people.

Note: Naomichi Ishige, a scholar of and expert on Japanese food history, writes (personal communication, March 2008): “To make *horo miso*, mix miso, minced walnut, sesame, and Japanese *sansho* pepper, then saute the mixture with vegetable oil in a pan. People eat *horo miso* with rice, or have it as a relish when they drink sake.

“In the *Jinrin kinmo zui*, the reason tatakhi natto is thin and formed is because people thought that type of natto could be easily dissolved in miso soup. However, its rectangular shape does not relate to the way of cooking.

“I am not sure how the peddler in the picture put his goods in a box that he carried. I only imagine that he wrapped a rectangular tatakhi-natto in a bamboo sheath and stored it in the box.

“When peddlers began to sell granulated *itohiki* natto, they put the *itohiki*-natto into a bamboo basket. They ladled up the quantity needed by a rice scoop (*shamoji*) and sold it. Or, they wrapped the *itohiki*-natto in a straw parcel and sold

the parcel.” See also letter about natto history from Ishige sensei to Shurtleff, dated 16 March 2008.

Page 225. The right illustration is titled *Tofu-shi* (Tofu maker). The text states: Among the craftsmen, tofu makers rise the earliest each morning. Some sell deep fried tofu pouches (*aburaagé*). The book *Kuni Hana Manyoki* mentions the places named Maruyama and Reizan where the craftsmen lived. There may have been a lot of tofu makers who lived in this area. The illustration shows a tofu maker in his shop, sitting at the end of a firm pole used as a lever press to press the soymilk out of the okara in the pressing sack (which is placed on a rack) into the wooden vat below. It will then be curded to make tofu. Also visible in the tofu shop are a wooden tofu forming box with 3 holes in each side, and four hanging *noren* curtains.

Page 291. The illustration is titled *Yaku-harai* (Driving out bad luck). The text mentions *setsubun* (the evening of the last day of winter, just before the first day of spring, also celebrated by some as New Year’s Eve—according to the old lunar calendar) and roasted soybeans (*iri-mamé*). On the evening of *setsubun*, Japanese wished to be cleansed of all bad spirits and bad luck. So they scattered roasted soybeans (with coins?) and cried out a slogan wishing for long life. This kept them very busy. Note: New Year’s Eve and Day are not traditional Japanese concepts; they were imported from China and the West during the 20th century. Address: Japan.

12. Hitomi, Hitsudai. 1695. *Pen chao shih chien / Ben zhao shi jian* [A mirror of food in this dynasty. 12 vols.]. Osaka?: Hiranoya Katsuzemon. 22 cm. Widely referred to as *Honchô Shokkan* in Japanese. Modern rendering by Morohashi 1955, trans. p. 13. Complete modern translation into Japanese by Isao Shimada (1976; Tokyo: Heibonsha). [Chi]\*

• **Summary:** This book, written by a Japanese man in Japan, yet entirely in Chinese, contains early references to yuba, frozen tofu, natto, shoyu, and miso. When the Japanese read the Chinese characters for yuba, *doufu-lao*, they pronounced them *tôfu no uba*. *Lao* or *uba* means “old woman” or “wet nurse.”

The book states that the word “natto” is derived from *nassho*, meaning “temple kitchen” or literally “place of offering, perhaps because the food was offered to Buddha before being offered to the monks.” It also contains the earliest known written mention of natto’s medicinal or healing effects, together with recipes for preparing natto miso soup (*natto-jiru*).

Note: Recall that this *natto-jiru* may well be made with fermented black soybeans rather than *itohiki* natto.

Saito (1985, p. 15-16) notes: “In 1695 Dr. Hitomi Hitsudai, a Japanese physician, age 74, writes the *Honcho Skokkan* and talks about the good and bad points of daily foods from his medical viewpoint. The 12 volume book is written entirely in Chinese. He writes: ‘Soybean: Makes one

feel calm, relaxes the stomach, and is good for the intestines. Miso: One should not be without it. Natto: Makes one feel calm, conditions the stomach, enhances a good appetite, and detoxifies poisons. Tofu: Nowadays tofu in Edo is pretty good. Among the various types, Nishiki-dofu and Kezo-in-dofu are famous... But it cannot compete with the tofu made in Kyoto. Shoyu: Inactivates any poisoning from eating food, drinking alcohol, or taking medicine.’ The above is taken from the translation into Japanese by Shimada Isao.”

T. Yokotsuka (1985, p. 206; 1986, p. 198) cites this as *Honcho Shokukan* (1692) but apparently does not cite it in his bibliography in either case.

Needham (1986, p. 581) cites this as *Pên Ts’ao Shih Chien* (Materia Medica in Tasteful Verse, by Chu Lun). Ch’ing dynasty. 1739. Partly translated by Swingle. But Needham does not discuss its content.

Fukushima (1989, p. 9) states that the *Honcho-Shokkan* (Hitomi, 1695) describes miso and shoyu.

Iino (2003, p. 8) states: “In the first half of the Edo Period (17th century), soy sauce was made in all regions of Japan and could be purchased anywhere. In addition, soy sauce was made by hand in the large majority of houses”—This is made clear by this references in this 1695 book, which also mentions the shoyu production process, noting that barley was used in place of wheat. On p. 9 Iino adds that detailed instructions for making *niban shoyu* (soy sauce from a second pressing of the moromi with salt water) are also described in this book. Iino then comments: “It is clear that with the beginning of soy sauce production, use was also made of the dregs [shoyu presscake] to make *niban shoyu*.”

13. Saito, Akio. 1699. [Chronology of soybeans in Japan, 1600 to 1699, the early Tokugawa/Edo period] (Document part). In: Akio Saito. 1985. *Daizu Geppo* (Soybean Monthly News). Jan. p. 14-16. [Jap; eng+]

• **Summary:** 1600–Komakabe?, the name of a type of tofu, appears in the *Diary of Oyudono no Kami* (*Oyudono Kami no Nikki*). The very firm tofu called *kata-dofu* that is presently sold in Kochi prefecture (on the southern part of the island of Shikoku) originated from Komakabe.

1601–Daté Masamune (DAH-tay Mah-sah-MU-nay; lived 1567-1636) of Sendai establishes the Goenso-gura and starts making miso. This is the first time that an organized method has ever been used to make miso in Japan. The purpose of this is to make miso for the army and to store salt. According to some theories, the date was 1645 rather than 1601.

1603–In *Nippo Jisho*, a Japanese-Portuguese dictionary, tofu (called “taufu”) is mentioned. It says that tofu is a food that is made from powdered / ground beans and that looks like freshly made cheese.

1605–Tokugawa Ieyasu commands the monks at Daifukuji temple to make Hamana Natto. Note 1. This is the earliest document seen (Nov. 2011) that mentions “Hamana

Natto” (or “Hamanatto,” regardless of capitalization). This document contains the earliest date seen for Hamanatto–1605! Note 2. This is the earliest document seen (Nov. 2011) stating that Hamanatto [fermented black soybeans] were made at Daifukuji temple in Hamamatsu.

1616–Tanaka Genba of Kamiusa no Kuni is advised to make tamari shoyu as a side business by Sanagi Kyurouemon of Settsu. The latter runs a sake factory and has a wholesale seafood products shop in Edo. This is the beginning of Choshi Shoyu and Higeta Shoyu.

1619–At about this time shoyu in quantity is brought from the Kyoto-Osaka area (*Kansai*) to Edo by Taru Kaisen and Hishigaki Kaisen. Note 1. A “Kaisen” is a ship that has a carrying capacity of at least 200 koku (= 9,520 gallons or 36,000 liters). That shoyu is regarded as the best quality and it soon takes over the entire Edo shoyu market.

1624-1644–Konpura Nakama (The union of merchants who go to Dejima / Deshima, an island in Nagasaki Bay) starts to export shoyu through the Dutch East India Company (*Higashi Indo Gaisha*) to Europe and Southeast Asia. It is said that in Europe this shoyu even reached the dining table of Louis XIV. Note 2. This document contains the earliest date seen for soybean products (shoyu) in Europe and Southeast Asia (probably Indonesia, 1644); soybeans as such had not yet been reported by that date. [Question: What is the source of these two dates?]

1626–Sendai Han (*daimyo* domain) starts to monopolize the selling of salt for the first time in the history of Japan. Because of this, all other Hans start to do likewise. Makabeya Ichibei of Kokubunji-cho in Sendai starts to sell Sendai Miso. He continues to sell his miso to the Han government for several generations.

1642–Because of famines in various provinces (*kuni*), the people were advised to eat coarse grains (*zakkoku*) and banned from eating rice. The sale of tofu, udon (wheat noodles), soba (buckwheat noodles), and *manju* (steamed glutinous rice cakes with a sweet azuki-jam filling) were also prohibited.

1645–The Ako Han starts a salt farm. Hatcho miso starts to be made in Mikawa, Okazaki. Hamaguchi Gihei of Hiromura in Kishu goes to Choshi and starts making shoyu. This is the beginning of Yamasa Shoyu.

1649 Feb.–The Tokugawa government (*bakufu*) passes a law to control the lives of farmers. Called Kanno Jorei (*Keian no Ofuregaki*), it states that farmers must plant soybeans and azuki beans between their rice fields and farms. Azé-mame (soybeans grown on the raised footpaths between rice fields) may have started from this forceful edict.

1652 May–Various farmers in Waksa, Kohama-han, Enshiki-gun? protest the heavy soybean tax increase. The farmland tax is often paid with soybeans. The leaders of the protest are killed.

1657 Jan. 18-19–A large fire (called *Sodefuri Kaji*) burned Edo (today’s Tokyo). Laborers came from throughout

Japan to reconstruct the city. To feed them, many sellers of pre-cooked, ready-to-eat food sprung up in Edo.

1666–Maruo Magouemon? Chotoku? of Hanshu Tatsuno makes Usukuchi Shoyu (light-colored soy sauce). After this, Tatsuno Shoyu’s main product becomes Usukuchi Shoyu.

1681–The government bans the withholding or monopolizing of crops (such as rice, barley, or soybeans) following a year with a bad harvest.

1695–Dr. Hitomi Hitsudai, a Japanese physician, age 74, writes the *Honcho Skokkan* and talks about the good and bad points of daily foods from his medical viewpoint. The 12 volume book is written entirely in Chinese. He praises the therapeutic virtues of soybeans, miso, natto, tofu, and shoyu. A translation into Japanese was later made by Shimada Isao.

1695–At about this time, tofu is sold by vendors sitting by the road. We do not know for sure when tofu was first sold by walking street vendors, but it is guessed that this may have taken place in about 1837-1853 when the book *Morisada Manko* was written by Kitagawa Morisada.

1696–There is famine throughout Japan. In eastern Japan, especially in Tsugaru Han, half of the population dies of starvation.

1696–One of the greatest scholars of agriculture during the Edo period, Miyazaki Yasusada (1623-1697), write *Nôgyo Zensho* (Encyclopedia of Agriculture). In it he described the many different colors, sizes, and shapes of soybeans cultivated at that time.

1697–Koikuchi shoyu, similar to the type made today, starts to be made from tamari shoyu in Choshi.

1698–After a big fire in Edo, sellers of Dengaku (skewered grilled tofu with a sweet miso topping) start to appear. Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

14. Terajima Ryôan. comp. 1711. *Wakan sansai zue* [Collection of Japanese and Chinese diagrams and drawings of all things]. Japan. 40 books, 106 sections. Japanese summary by Kawakami 1978, p. 269. Translation into modern Japanese titled *Wakan Sansai Zukai* published by Heibonsha in Toyo Pocket Library series. [Jap; eng+] • **Summary:** This is Japan’s oldest encyclopedia, written in *kanbun*, the Japanese transcription of Chinese writing. It is a Japanese compilation, which originated in Japan and is not a Japanese translation of a Chinese work. When cited in Chinese, the title in pinyin is: *Hehan sanchai tuhui* (W.-G. *Ho Han San Ch'ai T'u Hui*). The author’s nickname (*aza*) is Shojun; his artist’s name (*go*) is Kyorindo. The work contains many illustrations, although they were generally primitive and not very accurate.

In volume 105 (*Jozorui*), which is about brewing and fermented foods, a clear distinction is made between miso, shoyu, and tamari.

The section on yuba states: “Tofu film is made on the surface while making tofu. It looks like yellow paper. If

you stir too much, the film will not form properly. If you wish to obtain the film, add coagulant and boil the milk. The wrinkled look of the film resembles (the skin of) an old woman. If you remove too much film, the yield of tofu decreases and the tofu becomes hard to eat.” Yuba is referred to as *doufu-p'i*, the present Chinese term. When the text notes that yuba “resembles (the skin of) an old woman,” it seems to imply that the earlier term *lao* or *uba* was used because of the similarity of yuba and an old woman’s face.

T. Yokotsuka (1985, p. 206) cites this as “*Wakan sansaizue* (1715)” but apparently does not cite it in his bibliography.

Fukushima (1989, p. 9) states that the *Wakan Sansai Zue* (Narushima, 1712) describes miso and shoyu.

Ebine (1989, p. 91-93) gives the date of this work as 1712, and states that volume 105 describes the preparation of “tama-misho” using broad beans (*Vicia faba*; *Japanese: soramame*), and a “whitish misho” using soybeans. For each of these Ebine gives a flowchart. Rice or barley are soaked in water, steamed, and fermented to make rice koji, which is mixed with salt, and then the salted koji is mixed with broad beans that have been cooked and dehulled. The mixture is formed into balls, which are wrapped with rice straw, hung under the rafters over a fireside for several weeks, crushed in a mortar, then mixed with water to make tama-misho. To make whitish misho from soybeans and rice: 10 parts of soybeans are soaked in water, dehulled by brushing, and cooked. The hulls are first removed from the cooker, then the cooked beans are removed, formed into balls, and the balls are sliced. Meanwhile, about 14 parts of rice are polished, soaked in water, steamed, cooled, and allowed to mold spontaneously to yield 16 parts of rice koji. The rice koji, sliced soybean balls, and 1.3 parts of salt are mixed, pounded, packed into vats, and fermented for 10 days to yield the whitish misho.

C.N. Li (1958): *Making Fermented Products, Fermented black soybean sauce (shizhi; W.-G. shih chih)*. Note: Shih is often used at meals to harmonize the five flavors. People used to use it during this dynasty. Nowadays, if people do not use chiang, they do not use shih; they use soy sauce (*chiang-yu*), not fermented black soybean sauce (*shizhi*).

Modern rendering by Morohashi (1955). He translated p. 5 (roasted flour), p. 17 (fermented black soybean sauce). Confection of soy flour and *ame* = *Ame chimaki*. In “*Making Fermented Foods*.” Morohashi (1955) translated p. 5. *tou i (mame ame)*. In: vol. 10, p. 63.

Iino (2003, p. 8) notes that this 1712 book “states that soy sauce made from wheat is suitable for the public and soy sauce made from barley is of low quality.” Iino comments (p. 8-9): “Put simply, the soy sauce sold in shops was made from wheat because that made from barley was inferior.”

On the same page, Iino shows a full page reproduction of the page titled “shoyu” in this book. It gives: “An explanation of soy sauce production with an illustration

of the proper sort of barrel to be used.” Iino notes (p. 9): “Another method for producing soy sauce requires a heating process. The *Wakan Sansai Zue* states: ‘... Squeeze the *moromi* to extract the oil [sic, liquid]. If the color is light, the flavor will not be good. Boil the oil [liquid], place it in a pail and leave it over night to darken the color and improve the flavor. Mix the dregs [presscake] again with salt water and extract the oil [liquid]. This [second pressing] is called *niban shoyu* (second soy sauce), and the flavor is very much inferior.’”

15. Ryorikata banhô [Many methods for cooks]. 1766? Japan: Publisher unknown. 60 p. Japanese summary by Kawakami 1978, p. 165. [Jap]\*

• **Summary:** This manual, by an unknown author, describes how to make various foods, rather than how to prepare recipes. It discusses shoyu, barley hishio, Kinzanji miso, kiku hishio (it is not known what “kiku” means), hishio, natto, toko miso, uzu-miso, and amazake.

16. Shokumotsu waka honzô [The book of Japanese foods?]. 1795. Japan. [Jap]\*

• **Summary:** Mentions natto miso soup (*nattô-jiru*).

Note: Recall that this *natto-jiru* may well be made with fermented black soybeans rather than itohiki natto.

17. Matsudaira, Fumai? 1800. *Yotsu no toki no hana* [Flowers of the four seasons]. Japan. Publisher unknown. 2 large volumes. Japanese summary by Kawakami 1978, p. 157. [Jap]

• **Summary:** These two volumes of writing on cookery contain information on tea ceremony cuisine (*kaiseki ryori*) menus, including grilled tofu (*yaki-dôfu*), Simmering Tofu (*Yu-dôfu*), Miso no Sashimi, Natto Miso Soup (*Natto-jiru*), and Yamabuki Shoyu. The author, Matsudaira, lived 1751-1818.

Note: This is the earliest document seen (Dec. 2011) that mentions *nattô-jiru* [Natto Miso Soup] in connection with sticky natto.

18. Rakugo shôfurin [A treasury of witty stories]. 1830-1844. Japan. [Jap]\*

• **Summary:** This book contains an illustration of a natto seller by Shigemasa Kitao (see next page). He is crouched down between two tall wooden boxes, in which he carries his natto suspended from both ends of a shoulder pole. To his right stands a man in traditional Japanese dress, with kimono and geta footwear, waiting to buy some natto. Address: Japan.

19. Kitamura Kintei. 1830. *Kiyu shôran* [Play and laugh joyfully. Take a good look]. 12 volumes plus appendix. Japanese summary by Kawakami 1978, p. 238. [Jap]

• **Summary:** Tells the story of seasoned minced natto (*tataki-*



*nattô*) and whole-bean natto (*tsubu nattô*) in Edo (today's Tokyo).

Note: This is the earliest document seen (Jan. 2012) that contains the term “tsubu natto.”

20. Kitagawa, Morisada. 1853. *Morisada mankô* [Mr. Morisada's book of comical illustrations without particular thoughts]. Japan. [Jap]\*



• **Summary:** This book contains an early reference to *Kori-dofu* (dried-frozen tofu), and an illustration of a man selling natto (*nattô*). He is squatting with a bowl in one hand between two baskets of natto which are apparently connected by a shoulder pole. In his right hand is a cup with a handle on it, which he uses to scoop out the natto.

In *Tôfu no Hon* [The Book of Tofu], by Abe and Tsuji (1974, p. 8) is an illustration of a tofu street vendor taken from this book. It shows two types of shoulder poles and attached carrying containers. The upper left one is from the Edo / Tokyo area. The one actually on the man's right shoulder is from the Kyoto & Osaka area.

According to Saito (1985, p. 16) the book may also mention and have an illustration of a walking street vendor selling tofu. The author was born in 1810. The book may have a second title, *Ruijû kinsei fûzoku-shi*.

21. Sakato, Shi. 1859. *Ryôri chôhō-ki* [Records on convenience cooking]. Japan. 60 p. Unpublished manuscript. Japanese summary by Kawakami 1978, p. 177. [Jap]

• **Summary:** Contains many recipes for tofu and miso, plus amazake and shirozake (lit. “white sake”), hishio, natto, and Kinzanji miso.

22. Hepburn, James C. 1867. *A Japanese and English dictionary; with an English and Japanese index*. Shanghai, China: American Presbyterian Mission Press. xii + 558 + 132 p. 2nd ed. 1872; Abridged ed. 1873, 1881; 3rd ed. 1886; 4th ed. 1888; 5th 1894; 7th ed. 1903. First edition was reprinted in 1966 and 1983. Index. 24 cm.

• **Summary:** This is Hepburn's earliest Japanese-English dictionary. The words are arranged alphabetically by their romanized spelling. Each word is written in three ways. After the romanized word (main entry), written in uppercase letters with diacritical marks (which we have largely omitted below), the same word is written in katakana, then again in Chinese characters. Finally, one or more definitions are given.

Soy-related words and terms in the 1867 edition:

Amazake: Sweet sake, a kind of fermented rice.

Daidz [Daizu]: A kind of large white bean. *Soja hispida*.

Go: Beans mashed into paste. *Mame no go*.

Gokoku: The five cereals, wheat, rice, millet, beans, *kibi*.

Hiriodz [Hiriodzu, Hiryozyu]: A kind of food [made of tofu fried in oil].

Ireru—*Kono mame was yoku iremash'ta*: these beans are well parched.

Iriru—*Mame wo iriru*: to parch peas [beans].

Kinako [“yellow flour”]: A kind of food made of beans.

Kiradz [Kirazu]: The refuse left in making *tôfu*.

Koji: Malt made by fermenting rice or barley, in the process of making sake, and soy [sauce].

Koji-buta: A shallow box for holding malt.

Mame: Bean, pea. *Mame no ko*: bean flour.

Miso: A kind of sauce made of [soy] beans.

**NATTÔ, ナットウ, 納豆, n.** A kind of food made of beans.

Natto: A kind of food made of [soy] beans.

Nigari: The brine formed by the deliquescence of salt.

Sashi (verb): *Shoyu wo sashi*—To season with soy [sauce].

Sashimi: Raw fish cut in thin slices and eaten with soy.

Sh'taji [Sorted after “Shis,” Shitaji]: Soy (used only by women). Syn. Note 1. This is the earliest English-language document seen (March 2008) that uses the word “sh'taji” or shitaji” to refer to soy sauce.

Shoyu: Soy, a kind of sauce made of fermented wheat and beans. This is the earliest English-language document



seen (June 2010) that uses the word “shoyu” (spelled correctly like this) to refer to soy sauce.

Tofu: A kind of food made of beans.

Umeboshi (*hakubai*). Dried plums. Ume-dzke [Ume-zuke]: Pickled plums. *Ume ga mada umimasen*: The plums are not yet ripe.

Yuba [hot water + leaf]: A kind of food made of beans.

Yu-dofu: Boiled tofu.

Note 2. This is the earliest English-language document seen (Oct. 2008) that contains the word “yuba.”

The English-Japanese part of this dictionary starts after p. 558 and is titled “An index; or, Japanese equivalents for the most common English words.” Separately numbered to p. 132, it includes: “Bean, Mame. Barm, Kôji, tane. Pea, saya yendo [saya-endo]. Soy [sauce], Shôyu.”

Terms NOT mentioned include Aburaage, Aburage, Atsu-age, Daitokuji natto, Edamame (or Eda mame or Yedamame), Ganmodoki, Hamanatto, Hiya-yakko, Koridofu, Koya-dofu, Nama-age, Okara, Tamari, Tonyu, Unohana, Yaki-dofu.

Note 3. The author apparently did not realize that the various soyfoods he defined (with the possible exception of soy sauce) were made from soybeans.

Note 4. This is the second earliest English-language document seen (June 1999) in which Chinese characters are used to write the name of the soybean or related products.

Note 5. This is the earliest English-language document seen that contains the word “tofu,” or the word “natto” (Jan. 2012), or the word “koji” (March 2001).

Note 6. This is the earliest English-language document seen (Feb. 2004) that refers to amazake, which it calls “Amazake.”

Note 7. This is the earliest English-language document seen (Jan. 2006) that uses the term “Shoyu” (or “shoyu”) to refer to soy sauce.

Note 8. This is the earliest English-language document seen (Dec. 2005) that uses the word “Kinako” to refer to roasted soy flour.

Note 9. This is the earliest English-language document seen (Dec. 2008) that uses the word “Kiradzu” to refer to what is now called “okara,” or “soy pulp.” Address: Shanghai, China.

23. Pagés, Léon. 1868. Dictionnaire japonais-français [Japanese-French dictionary]. Paris: Firmin Didot frères, fils et cie. 933 p. See p. 597. [1 ref. Fre]

• **Summary:** This is a French translation of the Japanese-Portuguese dictionary published in 1603 in Nagasaki by the Society of Jesus [Jesuits].

Includes: Daizzou [daizu] (p. 252). (Mame), grains, ou haricots du Japon (*Soja hispida*, Moench.- Hoffm.).

Mame (p. 518). Haricots, ou pois chiches du Japon (*Soja hispida*, Moench.- Hoffm.).

Miso (p. 548): Certaine préparation de graines, de riz, et

de sel, avec lequel on assaisonne le *Chirou* [*shiru*] du Japon.

Nattô (p. 597). Certain mets de grains légèrement cuits, et ensuite mis au four. Nattôjirou [nattôjiru]. *Chirou* [*shiru*] ou bouillon fair avec des grains [nattô].

Note: This is the earliest French-language document seen (Jan. 2012) that mentions natto.

Tôfou [tofu] (p. 803). Espèce d'aliment qui se fait avec des grains pulvérisés, en manière de fromage frais. Tôfouya [tofu-ya]. Maison où l'on fait ou vend des especes de fromages, faits de grains amollis dans l'eau et réduits en pâte. Address: Japan.

24. Saito, Akio. 1868. [Chronology of soybeans in Japan, 1700 to 1868, the last half of the Tokugawa / Edo period] (Document part). In: Akio Saito. 1985. Daizu Geppo (Soybean Monthly News). Jan. p. 16. Feb. p. 10-11. [Jap]

• **Summary:** 1707 May—The Tokugawa shogunate government (*bakufu*) passes a law to lower the prices of goods. Shops selling high-priced tofu are punished. But tofu makers argue that although the price of soybeans has dropped, the prices of other ingredients such as nigari and oil have risen.

1709—Kaibara Ekken (1630-1714) writes *Yamato Honso*, in which he discusses the shapes and use of the 1,362 products from Japan, China, and other countries. He notes that among the five crops (*go-koku*), soybeans are the second most widely produced after rice.

1712—Kaempfer, the German physician and naturalist who stayed in Japan during 1691-1692, writes *Nihon-shi* in the Netherlands. In the book he discusses soybeans and includes a very accurate illustration of the soybean. This draws the attention of other European scholars.

1722—Kinzanji miso becomes popular in Edo (today's Tokyo).

1724 Feb.—The Tokugawa shogunate government commands that various goods, such as sake and shoyu [soy sauce], should be lower in price because the price of rice has decreased.

1726—The amount of shoyu imported to Edo from the Osaka-Kyoto area (*kudari shoyu*) is about 132,000 kegs (*taru*). Note: The average keg held 9 shô = 16.2 liters = 4.28 gallons (U.S.). Thus, 132,000 kegs = 564,960 gallons or 2,138,400 liters.

1730—The amount of shoyu imported to Edo from the Osaka-Kyoto area increases to 162,000 kegs.

1739—A French missionary living in China sends some soybean seeds to France for the first time. Attempts are made to grow them at the botanical garden, but the weather is not good and they fail. Later unsuccessful attempts were made to grow soybeans in Germany in 1786 and in England in 1790. There is another theory which says that the soybean went to Europe through Russia.

1748—The cookbook titled *Ryôri Kasen no Soshi* is published. It is the first cookbook which introduces the

present form of tempura batter.

1753—The Swedish naturalist Linne (Linnaeus; 1707-1778) gives the soybean its first scientific name.

1770—Sugita Genpaku (lived 1733-1817) discusses the nutritional value of foods and uses the word *eiyo* (meaning “nutrition”) for the first time in Japan.

1782—The book *Tofu Hyakuchin* (One hundred rare and favorite tofu recipes) is written by Ka Hitsujun (his pen name) of Osaka. He introduces about 100 tofu recipes. The next year he publishes a supplementary volume, *Zoku Tofu Hyakuchin*. He divides tofu recipes into five different categories according to their special characteristics, like common, regular, good, very good, and fantastic (*jinjohin, tsuhin, kahin, myohin, and zepin*). In his *jinjohin* category, he includes 36 recipes such as *Kinome Dengaku, Kijiyaki, Dengaku*, etc.—showing that these were common recipes of the period. Over the next several years, many books with the word “Hitsujin” at the end of the title appear.

1783-1787—The terrible famine of the Tenmei period (*Tenmei no Dai Kikin*) occurs. It is worst in Oou province, where several hundred thousand people die of starvation. Many farm villages are abandoned.

1788—At about this time the word *nukamiso* first appears.

1802—Takizawa Bakin (lived 1767-1848) writes *Kiryō Manroku*, a travel book, and in it he states: “Gion tofu is not as good as the *Dengaku* of Shinzaki, and Nanzenji tofu is not better than *Awayuki* in Edo. He criticizes tofu as a famous product from Kyoto (*Kyoto meibutsu tofu*) in his writing.

1804—Takahashi Fumiemon (or Bunuemon) on the island of Shodoshima starts making shoyu; he starts selling it in 1805.

1810—Choshi Shoyu receives an order from the Tokugawa Bakufu (*Gozen Goyo-rei*).

1818—There are now 10 miso manufacturers in Edo (today’s Tokyo). Yomo Hyobei’s miso shop in Shin Izumi-cho (presently Ningyo-cho 3-chome, Nihonbashi, Chuo-ku, Tokyo) has a prosperous business. In some funny poems (*Senryū*) this shop is mentioned: “With sake and miso their name is ringing in the four directions” (“*Sake, miso de sono na mo shiho ni hibiku nari*”). And: “This shop is surrounded by nested boxes for food, and these boxes are used for red miso” (“*Jūbako ni torimakaretaru shiho-ga-mise*”). His red miso and his fine sake made with water from a waterfall (*takisui*) are very popular.

1822—Pounded natto (*tataki natto*), an instant food made of chopped natto, sells for about one-fifth the price of tofu on a weight basis. The restaurant Sasa no Yuki in the Negishi area of Edo, becomes well known for its tofu cuisine.

1832—Shoyu production in Noda reaches 23,000 koku (1 koku = 180 liters or 47.6 gallons), compared with only 17,000 koku in Choshi. Thus Noda passes Choshi in shoyu production.

1839—Shibata Kyo (1783-1839), a follower of

Shingaku, writes *Zokuzoku Kyo Dowa* in which he pens words that later become famous: “In a place where the cuckoo can sing freely, you have to walk 3 *ri* (1 *ri* = 2.445 miles or 3.924 km) to buy your sake and 2 *ri* to buy your tofu” (*Hototogisu jiyu jizai ni naku sato wa, sakaya e san ri, tofu-ya e ni ri*). Shingaku, founded by Ishida Bangai, is a popular teaching of the time combining Shinto, Buddhism, and Confucianism (*Jugaku*). It emphasizes that “to understand heart/mind is the most important thing.”

1845—Inari-zushi becomes very popular in Edo. It originated around Hiranaga-cho (presently Sadacho 1-chome, Chiyoda-ku, Tokyo). It is made with deep-fried tofu pouches (*abura-agé*) stuffed with rice or okara and sells for 7 *mon* each.

1851—There are now 140 miso manufacturers in Edo. Half of them are in the Hongo area of Tokyo.

1853—Kitagawa Morisada (born 1810) writes *Morisada Manko*, the story of his life during the Edo period. In it he says of tofu: “In the Kyoto-Osaka area it is soft, white, and delicious, but in Edo [today’s Tokyo] it is hard, not white, and not tasty.” Of miso he says: “In the Kyoto-Osaka area many people make their own miso each winter, but in Edo people buy red miso and Inaka miso (from the countryside), and nobody makes their own miso.” Concerning the sale of natto (*natto-uri*) he says: “Cook soybeans, ferment them overnight, then sell them. In the old days, natto was sold only in the winter, but recently it has also come to be sold in the summer.”

1857—Soybean varieties brought back from Japan by the Perry Expedition are distributed to the U.S. Commissioner of Patents.

1858—Eitaro, a Japanese confectionery shop in Nihonbashi, Edo, starts selling Amanatto [sugar-sweetened red beans] made from Kintoki Sasage for the first time. Sasage is a type of cowpea [*Vigna sinensis*].

1864—For the first time shoyu made in the area around Edo (*Kanto shoyu*) is permitted to use the term “highest quality shoyu” *saijo shoyu* to describe the product.

1865—Inflation in Edo. The prices of rice, sake, miso, oil, vegetables, fish, etc. skyrocket. The Tokugawa Shogunate (*Bakufu*) orders people to lower their prices and forbids holding back or buying up goods. Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

25. Hepburn, James C. 1872. Japanese-English and English-Japanese dictionary. 2nd ed. Shanghai: American Presbyterian Mission Press. xxxi + 632 + 201 p. 28 cm.

• **Summary:** This is Hepburn’s 2nd Japanese-English dictionary. The words are arranged alphabetically by their romanized spelling. Each word is written in three ways. After the romanized word (main entry), written in uppercase letters with diacritical marks (which we have largely omitted below), the same word is written in katakana, then again in Chinese characters. Then comes an abbreviation of the part

of speech (n. = noun; v. = verb, etc.). Finally, one or more definitions are given.

This 2nd edition is 162 pages longer than the original 1867 edition; the Introduction is 19 pages longer, the Japanese-English section 74 pages longer, and the English-Japanese section 69 pages longer.

We will not repeat definitions that are identical to those in the 1867 edition. For new spellings, the 1867 spelling will be shown in parentheses. No new soy-related words were found in this 1872 edition. Soy-related words and terms in the 1872 edition: Adzuki (replaces Adzki) [azuki]. Amazake. Daidzu (replaces Daidz) [Daizu]. Hiriodzu (replaces Hiriodz) [Hiryozu]: A kind of food made of *tofu* fried in oil. Kinako.

Kiradzu. Koji: Barm or yeast made by the fermentation of rice or barley, in the process of making sake and soy [sauce]. Koji-butata: A shallow box for holding barm. Miso. Miso wo suru: To rub *miso* in a mortar. Natto.

Nigari. Sashi (verb). Sashimi. Shitaji (replaces Sh'taji). Note 1. This is the earliest English-language document seen (May 2008) that uses the word "shitaji" [spelled like this] to refer to shoyu or soy sauce.

Shoyu. Tofu: A kind of food made of beans, bean curd. Umeboshi (*hakubai*).

Yuba [hot water + leaf]. Yu-dofu.

The English-Japanese part of this dictionary starts after p. 558 and is titled "An index; or, Japanese equivalents for the most common English words." Separately numbered to p. 132, it includes: "Barm, Kôji; tane." "Soy, Shôyu."

Terms NOT mentioned include Abura-age, Aburaage, Aburage, Atsu-age, Daitokuji natto, Edamame (or Eda mame or Yedamame), Ganmodoki, Hamanatto, Hiya-yakko, Kori-dofu, Koya-dofu, Nama-age, Okara, Tamari, Tonyu, Unohana, Yaki-dofu.

Note 2. The author apparently still did not realize that the various soyfoods he defined (with the possible exception of soy sauce) were made from soybeans. Address: M.D., LL.D.

26. Hepburn, James C. 1873. Japanese-English and English-Japanese dictionary. Abridged by the author. New York: A.D.F. Randolph & Co.; London: Trübner & Co. vi + 330 + 206 p.

• **Summary:** "Preface: In order to render the Dictionary more portable and convenient in size, the Author has thought it best to abridge the larger work and bring it out in its present form. In so doing, he has omitted the Chinese and Japanese characters, the synonyms, and the examples showing the use of the words, excepting such as contained a peculiar idiom, and which could not be included in a definition. All the native Japanese words, with the exception of those which were rarely used or obsolete [such as Yu-dofu], have been retained; as, also, all the words derived from the Chinese which are in current use."

"The Second, or English and Japanese, Part, has not

been abridged or altered from the original, except in the correction of such typographical errors as were met with."

Note 1. New words in this edition that are not in the 1867 edition are preceded by "\*\*\*."

Soy-related terms: Adzuki: A small red bean. Amazake: Sweet sake, a kind of fermented rice. Daidzu: A large white bean. Soja hispida. Hiriodzu: A kind of food made of *tofu* fried in oil.

Kinako: A kind of food made of beans. Kiradzu: The refuse of beans left in making *tofu*. Koji: Barm or yeast. Koji-butata: A shallow box for holding barm. Miso: A kind of sauce made of beans.

\*\* Moromi: The grounds left in making soy [sauce], used as an article of food.

Note: This is the earliest English-language document seen (June 2011) that contains the word "Moromi." However the definition is poor. The word *moromi*, which is often translated as "mash," is the stage in making soy sauce (it has a consistency resembling apple sauce) before the liquid shoyu (soy sauce) is pressed out, leaving behind the shoyu presscake or residue (which could be called "grounds").

Natto: A kind of food made of beans. Nigari: The brine formed by the deliquescence of salt. Sashimi: Raw fish cut in thin slices and eaten with soy. Shoyu: Soy, a kind of sauce made of fermented wheat and beans. Tofu: A kind of food made of beans. Yuba: A kind of food made of beans.

Terms NOT mentioned include Aburage, Abura-age, Aburaage, Daitokuji natto, Edamame (or Eda mame or Yedamame), Hamanatto, Hiya-yakko, Koya-dofu, Kori-dofu, Okara, Tamari, Tonyu, Unohana, Yaki-dofu.

Note 2. The author apparently did not realize that the various soyfoods he defined (with the possible exception of soy sauce) were made from soybeans. Address: M.D., LL.D.

27. *Kogyo Tokei-hyo (Census of Manufacturers)*. 1878--.. Serial/periodical. Tokyo: Japanese Ministry of International Trade and Industry (MITI), Research and Statistics Dept. (Tsusho Sangyo Daijin Kanbo Chôsa Tokei-bu). Annual. [Jap]

• **Summary:** Contains statistics concerning Japan's industries and commodities. For example, in the report for the year 1987 (published in June 1989) under *miso* we find "124111 Miso (Including powdered or spray-dried miso). Total production in Japan: 641,337 tonnes. Value in million yen: 138,960. ??" Similar figures are given for each of Japan's 47 prefectures, listed from north to south, starting with Hokkaido and ending with Okinawa. The four largest producing prefectures are Nagano 186,316 tonnes (29% of the total), Aichi 63,294 tonnes, and Shin (?) 34,282, and Aomori 32,145 tonnes.

Note: The powerful and influential publisher, MITI, is called Tsûsan-sho in Japanese. Address: Tokyo, Japan.

28. Hepburn, James Curtis. 1886. A Japanese-English and

English-Japanese dictionary. 3rd ed. Tokyo: Z.P. Maruya & Co., Limited. Yokohama, Shanghai, Hongkong & Singapore: Kelly & Walsh, Limited. London: Trübner & Co. 962 p. 22 cm.

• **Summary:** “During the fourteen years which have elapsed since the publication of the last edition of this Dictionary [in 1867], the Author has kept it constantly before him, correcting errors, improving and enlarging the definitions, and adding new words and illustrations, according as his time and other important engagements allowed him. But owing to the amazing changes and rapid advancement of the Japanese in every department, he has found it difficult to keep pace with the corresponding advance of the language in the increase of its vocabulary. He has endeavored, however, to collect these words, examine, classify and define them. Many, no doubt, have escaped his notice. Still there is an addition of more than ten thousand words to the Japanese and English part.”

New soy-related definitions in this edition, not found in or changed from the 1867 edition: Aburage: Anything fried in oil or grease, especially fried *tofu*. Note: This is the earliest English-language document seen (June 2011) that uses the word “Aburage” to refer to deep-fried tofu pouches.

Amazake: Sweet *sake*, a kind of drink made of fermented rice.

Azuki: A small red bean, *Phaseolus radiatus*. Daizu: A kind of large white bean, *Soja hispida*.

Hiriōzu: A kind of food made of *tōfu* fried in oil.

Kinako: A flour made of beans.

Kirazu: The refuse of beans left in making *tōfu* [okara].

Note. This is the earliest purely English-language document seen (Aug. 2011) that uses the word “Kirazu” to refer to what is now called “okara” or “soy pulp.”

Koji: Barm or yeast made by the fermentation of rice or barley in the process of making *sake* or *soy* [sauce].

Miso: A kind of sauce made of beans, wheat and salt.

Miso wo suru: To rub miso in a mortar.

Sake: A fermented liquor brewed from rice. Sake wo kamosu: To brew sake. Sake ni yō: To be drunk. Sake no uye ga warui hito: One who behaves disorderly because of drink. Sake ni oboreru: To be addicted to drink [alcohol].

Shoyu: Soy, a kind of sauce made of fermented wheat and beans. Syn. [Synonym]: Shitaji.

Tamari: Soy, *shōyu*. Tofu: A kind of food made of beans, bean curd.

Unohana: The *Deutzia scabra*; also refuse of beans from making *tofu*. Yuba: A kind of food made of beans, the skin of bean curd.

Terms listed unchanged from the 1867 edition include Natto, and Yu-dofu.

No listing is given for: Daitokuji natto, Edamame [Yedamame], Hamanatto, or Okara.

The “English and Japanese dictionary,” which starts on page 771-73, contains the most important English words

with numerous examples. Included are: Bean: Mame. Spec. Azuki, sora-mame, daizu, endo, ingen, sasage. Bean pod: Mame no saya. Bean curd: *Tōfu*.

Soy: *Shōyu*.

Note 2. This is the earliest English-language document seen (Oct. 2001) that uses the word *Unohana* to refer to okara. Address: M.D., LL.D., Yokohama, Japan.

29. Tawara, R. 1887. *Nihon shoku no chōsa* (Zen kōno tsuzuki). *Shoku sen chōsa* [Investigation of Japanese foods. Part II]. *Tokyo Kagaku Kaishi* (*J. of the Tokyo Chemical Society*) 8:53-76, 77-101. [Jap]

• **Summary:** Discusses miso, natto, *tofu*, and yuba.

30. Hepburn, James C. 1887. *A Japanese-English and English-Japanese dictionary*. Abridged by the author. Second edition. Revised and enlarged. Tokyo: Z.P. Maruya & Co., Limited. Yokohama: Kelly & Walsh, Limited. London: Truebner & Co. vi + 330 + 962 p. 16 cm.

• **Summary:** Soy-related definitions include: Dengaku: A kind of food made of baked *tōfu*.

Go: [Soy] Beans mashed into paste for making *tōfu*; also used by dyers to limit colors. Mame no go: [Soy] bean paste.

Go-koku [Gokoku]: The five cereals—wheat, rice, millet, beans, and sorghum.

Hitashi-mono [Hitashimono]: Beans or vegetables boiled or steeped in *shōyu* [shoyu].

Irimame: Parched peas [sic, parched soybeans = soynuts].

Kirazu: The refuse of beans left in making *tōfu*.

Mamemaki: The ceremony of scattering parched [soy] beans about to drive out evil spirits on the last evening of the old [lunar] year.

Toshi-koshi [Toshikoshi]: The crossing from the old to the new year; the ceremonies observed on the last day of the year,... when parched [soy] beans are scattered after sundown to drive off noxious influences and evil spirits. The parched beans used this evening, if kept and eaten when the first thunder of the new year is heard, are supposed to protect against lightning.

Tsui-na (*oni yarai*): The ceremony of driving evil spirits out of the house by scattering parched beans about on the last evening of the old year.

Yō-kan [yokan]: A kind of confectionery made of sugar and [azuki] beans.

Yuba: A kind of food made of beans.

James Curtis Hepburn lived 1815-1911. Address: M.D., LL.D., Tokyo, Japan.

31. *Chemisches Central-Blatt*. 1894. Pflanzenkaese [German review of “On the vegetable cheese, natto” (Abstract)]. 1894(26):1049-50. Dec. 26. [1 ref. Ger]

• **Summary:** A German-language summary of the following English-language article: Yabe, Kikuji. 1894. “On the

vegetable cheese, natto.” *Bulletin of the College of Agric., Tokyo Imperial Univ.* 2(2):68-72.

Note: This is the earliest German-language document seen (Jan. 2012) that mentions natto, which it calls *Pflanzenkäese, der Natto*, and *Nattokäese*. Address: Imperial Univ., College of Agriculture, Tokyo, Japan.

32. Age (*The*) (Melbourne, Australia). 1894. [Vegetarianism in Japan]. Dec. 29. p. 4. [1 ref]

• **Summary:** This untitled article begins: “Japan is moving. The *Sei-i-kwai*, a medical journal published in Tokio, has a number of original articles in the English language, and while the tone and treatment are clearly imitative, there is nevertheless evidence of a certain originality of thought. The following of an extract from an article by Dr. Ishizuka on the Natural Food of Man affords a good example of the peculiar style and treatment.” Observes that the teeth of men or closer in structure and movement to those of herbivorous, than of carnivorous animals. “Now, among the foods which are fitted to the normal teeth of men, there is nothing better than the cereals.” “It is the general opinion at present that meat and vegetables are necessary articles for animal nutrition, but it is contrary to the principal purpose of creation... Consequently Shaka, the founder of Buddhism, separated days for abstaining from meat and fish in order to regulate the use of them, and Confucius also gave an instruction against the excessive use of meat. It will be clear then that meat is not an article of daily use.”

“It is a well known fact that Buddhist monks never eat meat and fish, but they eat beans more than most people in various forms, *miso*, *natto*, etc.”

33. Yabe, Kikuji. 1894. *Nattô no kenkyû* [Studies on natto]. *Nogakkai Kaiho (J. of the Scientific Agricultural Society, Japan)* No. 24. p. 3-10. Dec. [Jap]

• **Summary:** Also published earlier this year under the same title in *Tokyo Kagaku Kaishi (Journal of the Tokyo Chemical Society)* 15:196-205.

34. Yabe, Kikuji. 1894. *Nattô no kenkyû* [Studies on natto]. *Tokyo Kagaku Kaishi (J. of the Tokyo Chemical Society)* 15:196-205. Also in *Nogakukai Kaiho* 24:3-10 (1894). [Jap]

• **Summary:** For an English-language version, see Yabe’s 1894 article titled “On the vegetable cheese, natto” in the *Bulletin of the College of Agriculture, Tokyo Imperial Univ.* 2(2):68-72. Address: Nôgaku-shi, Japan.

35. Yabe, Kikuji. 1894. On the vegetable cheese, natto. *Bulletin of the College of Agriculture, Tokyo Imperial University* 2(2):68-72. German summary in *Chemisches Central-Blatt* 1894(2):1049-50. [Eng]

• **Summary:** “Since remote times there has been prepared in Japan from soya beans, a sort of vegetable cheese called *natto*. The beans are first boiled in water for five hours to

render them exceedingly soft. The still hot mass is in small portions wrapped in straw and the bundles thus formed, well tied at both ends, are then placed in a cellar, the middle of which a fire is kindled, whereupon the cellar is well closed. The heat is left to act for twenty-four hours, after which the product is ready for consumption. Although the moderate heat of the cellar acts only for twenty-four hours, there is still a considerable bacterial change going on. The microbes may be derived either from the air or from the straw. Of course it can not be expected that bacteria on the surface of the soya beans would still be very active. They are probably killed by the five hour’s boiling\*. (Footnote: \*Exceptional cases where bacteria can stand boiling heat still longer are known, for instance with *Bacillus subtilis*.) This product has a peculiar but not putrid smell. The soft mass of the beans is kept together by a very thick viscid substance. In this substance I have found four kinds of microbes present, and the chemical decomposition of proteids must be due to one or more of these microbes.”

The author then describes but does not give scientific names for the four microbes. Three of these were micrococci (a yellow, an orange yellow, and a white micrococcus), and the fourth was a small, not motile, bacillus which liquified gelatine and produced a greenish fluorescence. “With regard to the specific smell of *natto*, repeated experiments have convinced me that the above mentioned yellow micrococcus is the chief cause, while with regard to the slimy substance which shows such an enormous degree of viscosity further experiments have to be carried out; because the yellow micrococcus is not the cause of this viscosity.”

A table (p. 72) compares the nitrogenous substances in soya beans and natto made from those same soya beans. The moisture rises 3.9-fold from 15.16% to 59.12%. The total nitrogen increases by only 2%, from 7.355 to 7.542. Footnote: This may be chiefly due to the loss of carbon dioxide during the fermentation. The nitrogen of proteids (excluding peptones) decreases by 42%, from 6.899 to 4.033. The nitrogen of amides increases 14.7-fold from 0.128 to 1.892. The nitrogen of peptone increases almost five-fold from 0.328 to 1.617.

“There can hardly be any doubt that the *natto*-preparation is more easily digestible than the original soya bean, as it is very soft (Footnote: While the water of the air-dry soya bean amounted to 15.16%, that of *natto* amounted to 59.12%) and contains peptone” (p. 72).

Note 1. This is the earliest English-language document seen (Jan. 2012), written by a Japanese, that contains the word “natto.”

Note 2. This is the earliest English-language document seen (Jan. 2012) that gives a detailed description of how natto is made, its chemical composition, a little about its microbiology. and its final appearance, smell, etc. However, we told nothing about how or when it is eaten in Japan. Although Yabe mentioned *Bacillus subtilis* in a footnote (p.

68) as a heat-resistant bacterium, he did not realize that it was the actually the bacterium / bacillus that caused the natto fermentation.

Note 3. This is also the earliest English-language document seen (Jan. 2012) that uses the term “vegetable cheese” or the word “cheese” or the word “slimy” to refer to natto. Address: Nōgaku-shi; Tokyo Univ., Japan.

36. Yabe, Kikuji. 1895. [“On the vegetable cheese, natto”]. *Zentralblatt fuer Bakteriologie. Series 2.* 1(11):413-14. May 15. [1 ref. Ger]

• **Summary:** This is a German summary of the English-language article by Yabe which was published in 1894 in Japan in the *Bulletin of the College of Agric., Tokyo Imperial Univ.* 2(2):68-72. No German or other foreign title given.

“In Japan a vegetable cheese named ‘natto’ is prepared from soybeans...” (“In Japan bereitet man aus Sojabohnen einen ‘Natto’ genannten vegetabilischen Käse, indem...”).

Note: This is the earliest German-language document seen (Jan. 2012) that uses the words *Pflanzenkäse*, *der Natto*, or *Nattokäse* to refer to natto. Address: Nōgaku-shi, Imperial Univ., College of Agriculture, Tokyo, Japan.

37. Inouye, M. 1895. The preparation and chemical composition of tofu. *Bulletin of the College of Agriculture, Tokyo Imperial University* 2(4):209-15. Aug. [6 ref. Eng]

• **Summary:** One of the best early articles on tofu in Japan. Inouye tried to make a product resembling Swiss cheese with tofu, with moderate success.

“The efforts to prepare an easily digestible food from soya beans led to the preparation of *miso* and *natto*, two kinds of vegetable cheese, which were investigated some time ago in the laboratory of this college. (Footnote: On the preparation of *miso*, by O. Kellner, this Bulletin, Vol. 1, No. 6. On *natto*, by Yabe; Bulletin Vol. 2, No. 2).

“But the most interesting preparation is *tofu*, which consists principally of the protein-matter of the soya bean and which, according to the investigation of Prof. Osawa in Tōkyō, is as easily digestible as beef. This preparation is freshly made every day and sold in the form of tablets [cakes] about 10 c.m. broad, 2 c.m. thick, and 25 c.m. long [4 by 10 by 0.8 inches thick], is of snow-white appearance and of the consistency and taste of freshly precipitated casein of milk, but as there is no trace of bacterial action connected with its preparation, the name vegetable cheese is certainly not justified.” A table (p. 211) shows the composition of tofu a determined by *Kellner*.

“*Tofu* is also sold in another form called *kori-dofu* [dried-frozen tofu]. It is prepared by exposing the fresh *tofu* tablets to the action of frost, under which they shrink considerably, lose water, and become more compact. While fresh *tofu* contains, on an average, 89.02% of water, *kori-tofu* contains only 15.32% in the air dry condition. The analysis of *kori-dofu* gave me the following results: Water 15.32%.

Albuminoids 41.42%. Fat and lecithin 23.65%. Non-nitrogenous extract 15.05%. Cellulose 1.48%. Ash 3.08%.”

The author then describes the tofu manufacturing process, noting that it “is manufactured only on a small scale, by people who sell it in their own shops.” “The beans are first soaked for about twelve hours in water and then crushed between two mill-stones until a uniform pulpy mass is obtained. This is then boiled with about three times its quantity of water for about one hour, whereupon it is filtered through cloth. This liquid is white and opaque, exactly like cow’s milk; while the smell and taste remind one of fresh malt.” “I also analyzed the fresh milky liquid with the following results” for “Soya bean milk” and cow’s milk, respectively (p. 212): Water 92.53% / 86.06%. Albuminoids 3.02% / 4.00%. Fat 2.13% / 3.05% Fibre 0.03% /-. Ash 0.41% / 0.70%. Non-nitrogenous extract, including carbohydrates 1.88% /-. Milk sugar- / 5.00%.

“The fat contained in this liquid as well as in the *tofu*-tablets was found to consist partly of lecithin. *Tofu* dried at 100° yielded 26.65% fat and 4.83 gr. of this fat yielded, after igniting with carbonate of soda and nitrate of potash in the usual way, 0.280 grm. of magnesium pyrophosphate, which, when multiplied by the lecithin-factor, 7.2703, corresponds to 2.035 grm. lecithin, amounting to 11.2% of dried *tofu*, leaving for the genuine fat 15.4% (Footnote: A portion of this lecithin was probably present in the soya bean as lecithalbumin; comp. Leo Liebermann, J.B. f. Tierchemie, 1893, p. 32, and E. Schulze, *Chemiker Zeitung*, 1894, No. 43); more of the latter, therefore, is left in the refuse than of the former.”

Note 1. This is the earliest English-language document seen (March 2001) that contains the word “lecithin” or “lecithalbumin” in connection with soy—in this case *tofu*.

“In the manufacture of *tofu*-tablets from the freshly prepared milky liquid, about 2% of concentrated brine [natural nigari] as it is obtained as mother liquor from the preparation of sea salt, is added with constant stirring, whereupon a flocculent precipitate is soon formed which is separated by means of a cloth filter, slowly pressed, and then cut into tabular shape. I have tried to arrive at a satisfactory explanation of the nature of *tofu*, and have found that the salt-brine does not act by its chloride of sodium, but by the calcium and magnesium salts which are in it; for we can at once obtain precipitate from the milky liquid if we add a little calcium nitrate or magnesium sulphate, while we can not obtain any separation or precipitation by adding even considerable quantities of sodium chloride or sodium sulphate.”

“I have analysed a sample of the salt brine used for *tofu* making and found it to contain, besides chloride of sodium, 27.9% of chloride of magnesium and 7.0% of chloride of calcium.”

Footnote 4 (p. 213): “In order to see whether a product similar to Swiss Cheese could be obtained from the crude

soya casein or *tofu*, I infected 50 grm. of fresh *tofu* with a small dose of pulverised Swiss cheese, and added ten per cent of common salt to the mixture, pressed it in cloth, and allowed it to stand in a moist beaker glass for several months. The product resembled, only to a limited extent, the cheese from milk, but further experiments with the addition of small quantities of milk sugar are intended.”

Note 2. This is the earliest English-language document seen (Oct. 2003) that contains the term “soya bean milk.”

Note 3. This is the earliest English-language document seen (Oct. 2003) that contains the word “milky” in connection with soymilk, or that uses the term “milky liquid” to refer to soymilk. It is the second earliest English-language document seen (Oct. 2003) that mentions soymilk, and the earliest that mentions it in connection with Japan. However there is no suggestion that Japanese consume soymilk as a beverage.

Note 4. This is the earliest English-language document seen (March 2009) that uses the term “vegetable cheese” to refer to miso.

Note 5. This is the earliest English-language document seen (Feb. 2004) that uses the word “kori-dofu” to refer to dried-frozen tofu. Address: Nôgaku-shi [Prof. of Agriculture], Japan.

38. Yabe, Kikuji. 1895. Un fromage végétal, le “natto” [A vegetable cheese, natto]. *Annales Agronomiques* 21:494. [Fre]\*

39. Agricultural Society of Japan (*Dai Nihon Nokai*). 1895. Useful plants of Japan: Described and illustrated. Vol. 1. Tokyo: Agricultural Society of Japan. 233 p. See p. 5-6. 22 cm. [Eng]

• **Summary:** Discusses five varieties of *Glycine hispida* (p. 5-6) including: 21. Black soy-bean, Jap. *Kuro-mame*. “The beans have black skin. They are eaten either boiled or parched and also used to make *miso* (a kind of sauce with solid consistency), cakes, and *natto* (a cooked beans eaten as relish to rice).”

Note 1. The writer fails to mention that both miso and natto are fermented foods.

Note 2. This is the earliest English-language document seen (Jan. 2012) stating that natto is eaten with rice, or as a relish to rice.

22. White soy bean, Jap. *Shiro-mame*. Similar to No. 21 but the beans have yellowish-white skins. “Numerous varieties as to size, form, or duration of growth occur, and all are eaten either boiled or parched. Many important services are due to this bean. They are used to make malt [koji], *miso* (a kind of sauce), *shôyû* (bean sauce), and *yuba* (a kind of food). The *mamenoko* (bean flour) [probably roasted soy flour or *kinako*] is made of the beans and is eaten with *dango*, etc. It yields a dye called *Mame-no-go*. Oil is also pressed out from these beans. They are used in many other

different ways.”

Note 3. This is the earliest English-language document seen (Dec. 2005) that uses the word *mamenoko* to refer to roasted soy flour.

23. Green bean, Jap. *Ao-mame*. Similar to No. 21 but with larger seeds of greenish color. “One variety with green colour both of the skin and albumen called *Konrinzai* occurs, and is used to make *Aomame-no-ko* (green bean flour).

24. Jap. *Goishi-mame*. The seed of this variety is flat and black. Eaten boiled.

25. *Gankui-mame*. “Closely allied to the preceding. The beans are larger and thinner in the middle, and eaten principally boiled.”

Also discusses: Job’s tears (*Coix lachryma*, Jap. *Tômuji*, *Hatomugi*, p. 5. The grain is pounded in a mortar, cleaned, and “consumed as meal and *mochi*. An infusion of the parched and ground grains is used instead of tea, and is called *Kosen*.” Five varieties of adzuki beans (*Phaseolus radiatus*, p. 7-8).

Pea-nut (*Arachis hypogaea*, Jap. *Tôjin-mame*, *Nankin-mame*, p. 9. “They are eaten parched or used in confectionery, or to extract oil. A variety with larger nuts about 3 times bigger was introduced from America in 1873”).

Kudzu (*Pueraria thunbergiana*, Jap. *Kudsu*, *Makudsu*, p. 69-70, 92. “The largest roots are about 3-4 ft. [long] and about the thickness of a man’s arm. In winter they are taken, and an excellent starch is prepared from them. It is used for food or paste. The vine is used to make baskets, and its fibre is taken for cloth. The leaves are used to feed cattle”).

Sesame (*Sesamum indicum*, Jap. *Goma*, p. 84. “There are three varieties, black, white, and brown colored. The latter variety is the best to take oil. The oil is principally used for dressing food. The grilled seeds are used to add to cakes, salads, etc.”). Address: Tameike 1, Akasaka, Japan.

40. Yabe, Kikuji. 1895. Ueber einen vegetabilischen Kaese aus Sojabohnen [On a vegetable cheese made from soybeans]. *Landwirtschaftlichen Versuchs-Stationen* 45:438-39. [1 ref. Ger]

• **Summary:** This is a German summary of the English-language article by Yabe titled “On the vegetable cheese, natto,” which was published in 1894 in Japan in the *Bulletin of the College of Agric., Tokyo Imperial Univ.* 2(2):68-72. “The Japanese prepare from soybeans (*Sojabohnen*), which are rather rich in proteins, two types of cheese: miso and natto. Miso, made with koji, is consumed in greater quantities than natto (*Natto-Käse*; literally ‘natto cheese’).”

Note: This is the earliest German-language document seen (Jan. 2012) that uses the term *vegetabilischen Kaese* to refer to natto. Address: Japan.

41. Trimble, Henry. 1896. Recent literature on the soja bean. *American J. of Pharmacy* 68:309-13. June. [12 ref]

• **Summary:** One of the best early reviews of the literature, especially the Japanese and European literature, published in the United States. This paper introduced several new soyfoods (such as *natto* and *kori-dofu*) to the United States Contents: Introduction. Nutritional composition of the soja bean based on analyses of 5 samples from China, Hungary, France, and Japan. Diastatic enzyme / ferment “present in the soja beans to a greater extent than in many other leguminous seeds (see Güssmann 1890). Composition of etiolated soja shoots [sprouts]. The oil [of the soja bean]. Starch content. Sugar content. Use of soybeans as food in Japan. Miso. Natto. Tofu. Kori-dofu. Introduction of the soja bean to the United States in about 1888. Ability to obtain nitrogen from the air.

“The immediate excuse for the appearance of this paper is the fact that a number of contributions have recently appeared on the soja bean, notably from the College of Agriculture, Imperial University of Japan.”

“The oil may be extracted by pressure or by means of solvents [in the laboratory]; it is said to possess some laxative properties, is of a yellowish brown color, and has a slightly aromatic odor; it is intermediate between the drying and non-drying oils.” The following constants, based on Stingl and Morawski (*Chemiker Zeitung*, 1886, p. 140) are given: “Specific gravity at 15°C: 0.924. Point of solidification: 8-15°C. Fusing point of the fatty acids: 27-29°C. Point of solidification of fatty acids: 23-25°C. Temperature rise: 59°C. Iodine number: 121.3. Iodine number of the fatty acids: 122. Saponification number: 192.5. Note: Trimble actually got these constants from *J. of the Society of Chemical Industry*, 31 May 1893, p. 453-54, which summarised an Italian-language article by De Negris and Fabris (1891), whose values confirmed those obtained by Stingl and Morawski.

Trimble (p. 311-12) gives a good, detailed description of natto based entirely on Yabe (1894). Parts of his summary perceptive: “Yabe found in this substance four kinds of microbes present, and he believes the chemical decomposition of the proteids to be due to one or more of these microbes... A chemical investigation by the author just mentioned [Yabe] revealed tyrosine, peptone, guanine, leucine and xanthine. The total proteids amounted to considerably more in the *natto*, when allowance is made for moisture, than existed in the original bean, and the artificial product is also considered to be much more digestible.”

Concerning tofu and soymilk: “A still more interesting preparation of the soja bean than either of the preceding [miso and natto] is *tofu*. This has been described and investigated by M. Inouye (*Bulletin Imp. College of Agriculture*, Vol. 2, No. 4 [1895]). The beans are first soaked for about twelve hours in water, and then crushed between two millstones until a uniform pulpy mass is obtained. This is then boiled with about three times its weight of water, and filtered through cloth. The liquid filtrate is white and opaque,

very closely resembling cow’s milk, while the odor and taste remind one of fresh malt. On standing, the liquid becomes sour from the formation of lactic acid, and a coagulation of the casein takes place. The freshly boiled and filtered liquid is coagulated either by the addition of a portion of the sour liquid which has been set aside from a previous lot, or it is treated with about 2 per cent of a concentrated brine, such as is obtained as mother liquor from the preparation of sea salt.”

“Somewhere about the year 1888 the soja bean was introduced into the United States. It has been tried in a number of State Experiment Stations, and is gradually working into favor in the Southern States. In Kansas the plant has been found to withstand considerable drought... The plant is valuable for forage or soiling. The beans have been produced in South Carolina to the amount of 10 to 15 bushels per acre. On account of their richness in oil they have been used as a substitute for cotton-seed meal in feeding cattle, with very satisfactory results.

“The plant is believed to have, in common with most leguminosæ, the power of obtaining some of its nitrogen from the air, and hence, of acting as a soil renovator.”

Note 1. This is the earliest document seen (March 2002), published in the USA, that contains the word *tofu*, or *kori-dofu* [dried-frozen tofu], or that discusses soymilk.

Note 2. This is the earliest English-language document seen (March 2003), published in the USA, that uses the word “crushed” or one of its cognates (crushing, crushers, etc.) in connection with soybeans.

Note 3. This is the earliest U.S. document seen (Sept. 2002) that mentions the use of a solvent for extracting the oil from soybeans.

Note 4. This is the earliest English-language document seen (March 2008) that contains the term “iodine number” (regardless of hyphenation or capitalization).

Note 5. This is the earliest English-language document seen (March 2008) that contains the word “drying” in connection with soy oil and its iodine number, or that states that soy oil is intermediate between the drying and non-drying oils. Address: USA.

42. Yabe, Kikuji. 1896. Kaese aus sojabohnen [“Cheese from soybeans”]. *Zentralblatt fuer Bakteriologie. Series 2.* 2(23/24):769. Dec. 24. [2 ref. Ger]

• **Summary:** This is a German-language review of an article from the *Nederlandsch Landbouw Weekblad*. 1896. No. 82—from *Molkerei-Zeitung*. 1896. No 43. The Japanese prepare from the Legumin-rich soybean two types of cheese, which are named miso and natto. Address: Nôgaku-shi, Imperial Univ., College of Agriculture, Tokyo, Japan.

43. Langworthy, C.F. 1897. Soy beans as food for man. *Farmers’ Bulletin (USDA)* No. 58. p. 20-23. July 7. Revised (very slightly) in 1899. [1 ref]

• **Summary:** Describes and gives the nutritional composition



of various Japanese soyfoods, including natto, miso (white, red, or Swiss), tofu, frozen tofu, yuba, shoyu. Many of his descriptions of soyfoods are based on Trimble (1896).

“Tofu, or bean cheese, is prepared as follows: The beans are soaked in water for about twelve hours, and crushed between millstones until of a uniform consistency. The ground material is then boiled with about three times its bulk of water for about an hour, and filtered through cloth. The filtrate is white and opaque, having somewhat the appearance of milk. It has, however, the taste and smell of malt. This milky liquid, to some extent, resembles cow’s milk in composition, as is shown by the following table.” The table, titled “Comparison of the composition of soy-bean milk and cows’ milk,” shows that the two liquids (soy / cow) have the following composition: Water 92.53% / 86.08%, albuminoids 3.02% / 4.00%, fat 2.13% / 3.05%, etc.

“The protein in soy-bean milk is precipitated by adding the mother liquor obtained in the manufacture of salt from sea water, which contains considerable magnesium chloride. The precipitate is filtered off and formed into cakes with the hands. It is eaten in the fresh state or frozen. In the latter case it loses part of its water.”

“Though these soy-bean products are prepared chiefly in Japan and other eastern countries, their manufacture has been attempted to some extent in Switzerland and elsewhere...”

“Bean sausages in considerable variety are prepared in Germany, and formed part of the ration of the German soldier in the Franco-Prussian war. So far as can be learned, these are always made from ordinary varieties of beans and not from soy beans...”

“Under the name of coffee beans, soy beans are eaten to some extent in Switzerland as a vegetable, and dried and roasted are also used as a coffee substitute. Their use for this latter purpose is not unknown in America. The attempt has recently been made by certain dealers to place the soy bean on the market as a new substitute for coffee and to sell it under other names at an exorbitant price.

“Bulletin No. 98 of the North Carolina Experiment Station recommends soy beans as a palatable vegetable when prepared as follows: Soak the beans until the skins come off and stir in water until the skins rise to the surface and then remove them. Boil the beans with bacon until soft, season with pepper, salt, and butter, and serve hot. If the beans are green the preliminary soaking may be omitted. No other references to the use of soy beans for human food in the United States have been found.”

Note 1. This is the earliest English-language document seen (Oct. 2003) that contains the term “soy-bean milk.” It is also the earliest U.S. government document or USDA document seen (May 2006) that uses the term “soy-bean milk” (or any other term containing the word “milk”) to refer to soymilk.

Note 2. This is the earliest document seen (Jan. 2005) concerning the work of the USDA with nutrition (or home

economics) and soybeans. Address: Office of Experiment Stations, USDA, Washington, DC.

44. Trimble, Henry. 1897. The soy bean. *American J. of Pharmacy* 69:584-93. Nov. [11 ref]

• **Summary:** Much of this material is derived from Williams and Langworthy (1897). Illustrations (p. 585, from Williams, p. 5) show: (a) flowering branch of a soy bean plant (reduced 2/3), (b) one of the flowers (enlarged), (c) pods of a soy bean plant (reduced 2/3).

One table (p. 588) shows the chemical composition of various kinds of forage made from the soy bean (fresh or air-dry substance, or water-free substance): Fodder (early bloom to early seed), soy-bean hay, straw, straw (hulls and vines after threshing), soy-bean seed, soy-bean meal (18.9% / 21.0% fat), soy-bean ensilage, corn and soy-bean ensilage, millet and soy bean ensilage.

Another table (p. 591) shows the composition of the following “Soy-bean food products”: Fresh tofu, frozen tofu, natto, yuba, white miso, red miso, Swiss miso, and two types of shoyu. For each is given the percentage of water, protein, fat, nitrogen-free extract, fiber, and ash [minerals].

Note: This is the earliest English-language document seen (Sept. 2011) that contains the term “soy-bean food” or “soy-bean food products.” It is also the earliest document seen (Sept. 2011) concerning the etymology of the word “soyfoods.” Address: USA.

45. Lafar, Franz. 1897. Technische Mykologie. Ein Handbuch der Gaerungsphysiologie... Erster Band: Schizomyceten-Gaerungen [Technical mycology. A handbook of fermentation physiology... Vol. 1: Schizomycetic fermentations]. Jena: Verlag von Gustav Fischer. xiii + 362 p. See p. 290, 305-15. Illust. No index. 25 cm. Foreword by Prof. Dr. Emil Chr. Hansen (Carlsberg-Laboratorium, Kopenhagen [Copenhagen]). [7 ref. Ger]

• **Summary:** The introduction gives a detailed early history of the discovery of fermentation, microorganisms and *Mikrozymen / Mikrozyrna* (microzymes) (including the work of Needham, Spallanzani, Franz Schulze, Theodor Swann, Schröder and Dusch, Louis Pasteur, and Béchamp), its relation to spoilage, the development of fermentation theory, and the nature of the fermentation organisms.

In Chapter 31, “Cheese fermentations and related decompositions,” section #179 is titled “Natto and miso.” These fermented foods are both made from the soybean (*Soja-Bohne*). For natto: The fermentation results in a partial transformation of the proteins into amides, peptones, guanin, xanthin, and tyrosin. The resulting mass is called natto in Japan, and is sold commercially. Note: Even though the word “enzymes” is not used, the author describes their action. This is the earliest document seen (July 2003) describing the action of enzymes produced during a soybean fermentation. At the end of the same section, koji, shoyu, tofu, nukamiso,

taohu, and tao-yu (Chinese-style tofu and soy sauce) are mentioned—with 7 partial references.

Chapter 33, titled “The binding of free nitrogen by bacteria” (p. 303-17) discusses this relatively new idea in depth, including the discovery of root nodules on legumes, the origin and function of the nodules, and the nodule bacteria; Soybeans are mentioned on p. 303. Chapter 36, titled “Nitrogen-fixing bacteria” (p. 335-43) gives more details.

Note 1. Although there are many in-text citations, the bibliography for this volume appeared in Vol II, published in 1901-1907. An English-language translation of this volume was published in 1910.

Note: This is the earliest document seen (Sept. 2002) concerning the early history of microbiology and the discovery of enzymes. Address: Unestablished university lecturer (*Privatdozent*) for Fermentation-Physiology, Technical High School. Assistant at the Physiological Laboratory of the Royal Experiment Station for the Fermentation Industry at Hohenheim near Stuttgart [Germany].

46. Brinkley, Frank; Nanjô, F.; Iwasaki, Y.; Mitsukuri, K.; Matsumura, J. 1898. An unabridged Japanese-English dictionary: With copious illustrations. Tokyo: Sanseido. xxvi + 1687 p. Illust. [Jap; Eng]

• **Summary:** For each entry, the romanized word comes first, followed by the word written in hiragana and then in kanji (Chinese characters). Note: The authors often use the word “bean” when they should use the word “soybean.” Soy related:

“Aburage: Bean-curd fried in oil.

“Amazake: Sweet *sake*; a kind of drink made of fermented rice. Syn. [Synonym]: Hitoyozake, Kozake.

“Ame: A honey-like jelly made of flour of various grains; starch-sugar.

“Ammochi: Mochi stuffed or covered with boiled and crushed pea-beans [sic, azuki beans] mixed with sugar.

“Azuki [bot.] Mungo.

“Azuki meshi: Rice and red pea beans mixed and boiled for food.

Azuki mochi: Same as Am-mochi.

“Dengaku: (2) (Coll.) *Tôfu* baked and covered with sweetened miso. *Dengaku wo yaku*: to bake or prepare *dengaku*.

“Dengaku-dôfu: See above.

“Daizu (Bot.) Soja bean.

“Edamame: (1) (lit.) Branch bean. (2) (coll.) [Soy] Beans boiled in pods on the stalks.

“Gobuzuke: Dried radish chopped into pieces of about 5 *bu* (of half an inch) in length and cooked with soy [sauce] and sugar.

“Gusokuni: Lobster chopped into transverse pieces and cooked with sugar and soy.

“Hachihaidôfu: *Tôfu* chopped into small pieces and boiled in a soup composed of four cups full of water, two of soy, and two of sake.

“Hitasu—Shôyu ni hitasu: To steep in soy.

“Hiyayakko: *tôfu* served cold.

“Ikanago-shôyu: Soy prepared in Sanuki [on Shikoku island], from a kind of fish called *Ikanago*.

Irimame: Parched peas or [soy] beans. *Irimame ni hana ga saku* (coll. Prov.) (lit.) blossoms on parched peas; something regarded as impossible.

“Iritori: Fowls boiled with a mixture of sugar, soy and *mirin* until the sauce is fully absorbed.

“Iritsuke: Any fish roasted or boiled in a pan until the sauce or soy is fully absorbed.

“Kabayaki: (1) A way of roasting fish. (2) Eels cut open on the dorsal line, covered with soy mixed with sugar, and roasted. (3) Unagi no kabayaki: Roasted eels.

“Kenchin: (Modern Chin.) (1) Black beans malted and fried, and eaten with soy or table salt. (2) A soup containing various vegetables and *tôfu* mixed together and fried.

“Kigaracha-meshi: Rice boiled with water and a small quantity of *sake* or soy (so called from its yellowish color).

“Kijiyaki: The flesh of bonito or tunny-fish covered with soy and sugar, and baked.

“Kinako: [Soy] Bean flour (of yellowish or greenish color).

“Kinome-dengaku: *Tôfu* or the fruit of the egg plant covered with a pasty mixture of *miso*, sugar, and the buds or leaves of the *sanshō*, and baked.

“Kiuri-momi: Cucumber chopped fine and seasoned with salt, vinegar and soy.

“Kôji: Yeast, barm [sic]. *Kôji wo nekasu*: To make yeast [sic, kôji].

“Kokushô: A soup prepared with *miso* and the flesh of *koi* [carp] (*cyprinus haematoperus*).

“Kombumaki: Roasted or cooked fish wrapped in a piece of *kombu*, tied and boiled with sugar and soy.

“Kuromame: (Bot.) Black soy bean.

“Kyarabuki: The stems of the *fuki* boiled with soy.

“Mamemaki: A ceremony of scattering parched peas [sic, soybeans] about in an occupied house to drive out evils spirits, celebrated on the last night of December, or the early part of January (o.s.) [old style] crying aloud the while *fuku wa uchi* (fortune inside), *oni wa soto* (devils outside). Syn. Oniyarai, Setsubun.

“Mame-no-ko: [Soy] Bean flour used for covering or sprinkling over *mochi*, *dango*. Syn. Kinako.

“Miso: A kind of sauce made of wheat, [soy] bean, and salt. *Miso wo tsukeru*: (a) (lit.) to spoil (as one’s coat) with miso. (b) (fig. coll.) to disgrace one’s self; *Tonda miso wo tsuketa*: (coll.) have met with a shocking failure.

“Misokoshi: A miso strainer.

“Misomame: (Bot.) Soja bean, Glycine.

“Misoshiru: A kind of soup made with miso.

“Moromi: The grounds or lees left in making soy or *sake* and used as food.

“Moromi-sake: A kind of sake with rice grounds not separated from the liquid. Syn. Doburoku, Nigorizake.

“Murasaki: Another name for the sardine, or for soy. Namaage or Nama-age: Not listed.

“Nattô: A kind of food made of boiled [soy] beans (usually sold in small packages made of rice straw).

“Nigari: The brine left by the deliquescence of salt.

“Nigashio: Same as Nigari.

“Oborodôfu: (1) A *tôfu* boiled down until it is almost dry and relished with soy and sugar. (2) A kind of *tôfu* [sic, unpressed tofu curds].

“Oname: (Bot.) Soy bean.

“Satsuma-iri: Food prepared by cooking a mixture of parched rice and finely chopped sweet potato, and relishing it with soy and sugar.

“Shitaji: Soy. See *Shôyu*.

“Shôyu: A kind of sauce made by pressing a fermented mixture of calcined barley meal, boiled [soy] beans, yeast, water, and salt; soy. Syn. Shitaji, tamari.

“Shôyu no moromi: Soy before it is pressed.

“Suiri: Cooked with vinegar. *Iwashi no suiri*: A sardine cooked with a mixture of vinegar and soy. Syn. Suni.

“Sukimi: Flesh of fish sliced thin, and eaten relished with soy and *wasabi* or horse-radish.

“Sukiyaki: Roasting sliced meat or flesh with soy, in a shallow pan.

“Sumiso: A kind of sauce made by rubbing together *miso* and vinegar in a mortar [suribachi].

“Suribachi: An earthenware vessel used in rubbing *miso*; a mortar.

“Sushi: (1) Fish seasoned with vinegar. (2) A general name for food made of boiled rice and fish, eggs, vegetable, etc. seasoned with vinegar and soy. As an affix the form is changed to *zushi*. *Inari-zushi*: food made of fried *tôfu* stuffed with a kind of *chirashi-zushi*.

“Tamari: Soy before it is pressed [sic].

“Tekkamiso: A kind of food made by roasting *miso* mixed with parched beans, chopped burdock, and a little oil.

Temae: (1) One’s own side. *O temae miso wa shio ga karai*: (coll.) Self approbation is disgusting.

“Teriyaki: Flesh of fish baked with a kind of sauce composed of soy, *mirin*, and sugar.

“Tôfu: A kind of food made from bean curd hardened by mixing with a small quantity of the brine left after the deliquescence of salt [nigari]. In composition the form changes into dôfu. *Tôfu ni kasugae*: (Prov.) (lit.) an iron clamp to connect pieces of tofu; no effect. Yaki-dôfu: Baked [grilled] *tôfu*.

“Tsukuru: To pickle in sake, brine vinegar, etc. *Shôyu wo tsukete yaku*: To bake [grill] seasoned with soy. Syn. Hitasu, uruosu.

“Uchimame: The soy bean flattened with hammer and

boiled in soup.

“Udondôfu: Tôfu cut into udon like pieces, and eaten boiled in a soup made of cups of soy, two of *sake* in four cups of water.

“Yuba: The skin of bean curd used as food. Syn. Uba.

“Yudôfu: Boiled *tôfu*.” Address: 1. Captain, R.A., Editor of the *Japan Mail*; 2. M.A., Bungakuhakushi; 3. Nôgakushi.

47. Fruwirth, Carl. 1898. *Anbau der Huelsenfruechte [Cultivation of legumes]*. Berlin: Verlagsbuchhandlung Paul Parey. xii + 274 p. See p. 11-13, 19, 47, 214-19 (Die Sojabohne), 264, 272-73. Illust. No index. 19 cm. [5 ref. Ger]

• **Summary:** Contents: Vernacular names in other countries. Botanical characteristics. Varieties, types (*Varietäten, Sorten*). Natural history. Uses and significance. Demands placed on the soil and climate (*Wärmesumme* or “heat units”). Use of fertilizers. Preparing the soil. Planting and seed. Harvest and yields. Animal pests. An illustration (p. 215) shows the leaves and buds of a soybean plant (*Glycine hispida*).

Concerning varieties and types: In addition to the yellow-seeded form, soybeans (*Sojas*) with brown and with black seeds are also cultivated in Europe, and both likewise belong to the *Soja tumida* group. However the distribution of these latter two is insignificant. Haage and Schmidt, the seedsmen in Erfurt, sell a green-seeded form named Bluish-green Soybean (*Blaugrüne Soja*). 100 seeds weigh 8-13 gm. One liter of seeds weighs 712-717 gm. Individual seeds are 7-8.2 mm long, 5-5.5 mm wide, and 3.2-4 mm high.

Yield: The yield obtained in Hungarian Altenburg was 1,600 to 2,100 liters of seed and 1,300 to 1,600 kg of straw per hectare. The yield in Bavaria (*Bayern*), based on many trials, averaged 2,400 kg/ha of seed. Haberlandt calculated the yield, based on trial plots with small areas, at 1,685 kg/ha. The range in yield is considered to be 700 to 3,000 kg/ha of seeds and 1,200 to 3,000 kg/ha of straw.

A table (p. 266-73) gives the composition on an as-is and moisture-free basis of all legumes discussed in this book.

Note: Karl Fruwirth was born in 1862. Address: Professor at the Royal Agricultural Academy (an der Koenigliche Landwirtschaftlichen Akademie), Hohenheim [Württemberg, Germany].

48. *Proceedings of the American Pharmaceutical Association*. 1898. Report on the progress of pharmacy. 46:582-1120. See p. 857-60.

• **Summary:** In the section titled “Materia medica,” under “Vegetable drugs,” we read: “*Soy Bean-Food Value, etc.*—Referring to his paper on the soja bean (see Proceedings 1896, 634), in which he gave a summary of the literature on this valuable food product, Prof. Henry Trimble reproduces in the abstract a recent paper entitled “The Soy Bean as a Forage Crop,” by Thomas A. Williams, with an appendix

on “Soy Beans as Food for Man,” by C.F. Langworthy, published in *Farmer's Bulletin*, No. 58, issued by the U.S. Department of Agriculture. While not adding anything new to the knowledge of the digestive ferment, which was prominently discussed in the summary above referred to, there is much valuable information that is of interest to the pharmacist.

Discusses *Glycine hispida*, soy bean, Prof. Haberlandt, yuba, shoyu, tofu, frozen tofu, natto, and miso.

See: Trimble, Henry. 1897. “The soy bean.” *American J. of Pharmacy* 69:584-93. Nov.

49. Langworthy, C.F. 1899. Appendix: Soy beans as food for man. *Farmers' Bulletin (USDA)* No. 58 (Revised ed.). p. 20-23. [1 ref]

• **Summary:** This part of Bulletin 58 is identical to the original July 1897 edition. Address: Ph.D., Office of Experiment Stations, USDA, Washington, DC.

50. Saito, Akio. 1899. [Chronology of soybeans in Japan, 1868 to 1899, first half of the Meiji period] (Document part). In: Akio Saito. 1985. *Daizu Geppo (Soybean Monthly News)*. Feb. p. 11-12. [Jap]

• **Summary:** 1871 July—A brewing tax (*jozo-zei*) and patent tax are levied on clear sake (*seishu*), unclear sake (*dakushu*), and shoyu. But in 1875 the two taxes on shoyu are discontinued because shoyu is considered one of the necessities of life.

1873—At about this time a sincere farmer, Itoi Mosuke, of Akita prefecture finds a special type of soybean and names it Itoi-mame. Later the name changes to Ani and they are cultivated all over Akita prefecture.

1873 May—The Japanese government exhibits soybeans at the exposition in Vienna, Austria. And the USA becomes interested in soybeans. Also at this expo, Kikkoman uses glass bottles for their shoyu for the first time.

1875—At about this time, shoyu becomes so popular overseas that a German-made fake shoyu appears.

1877—There are now 40-50 miso shops in Tokyo, centered in Hongo (which comprises the areas of Yotsuya, Fukagawa, Shiba, Shinagawa, Ooi, Oshima, etc.).

1877 Feb.—Dried-frozen tofu (*kôri-dôfu*) is purchased as an army supply for the Seinan no Eki war.

1877 Aug.—The first domestic exposition is held in Japan, at Ueno Park, Tokyo. Kikkoman shoyu wins an award.

1878—The quick method of miso fermentation (*miso no sokujo-ho*) is mentioned in a government report.

1878—The first official government statistics on soybean cultivation in Japan start to be compiled. This year the area is 411,200 hectares and production is 211,700 tonnes [yield = 514 kg/ha].

1879—The price of high-quality miso in Tokyo is 4 *sen* per kg. In 1980 the price is 303 yen/kg—or about 7,575 times

higher. Note: From now on prices from the Meiji era come from a book titled *History of Lifestyle of the Meiji, Taisho, and Showa periods as seen from prices of the day (Nedan no Meiji Taishi Showa Fuzoku Shi)*. It is published by the Weekly Asahi (*Shukan Asahi*).

1882—Around this time many small shoyu manufacturers appear and quite a few bad quality shoyu products are on the market. Shoyu loses considerable consumer confidence.

1885—The price of 1 keg (*taru*, 16.2 liters or 9 *sho*) of shoyu at this time is as follows: Highest grade (*jo no jo*) (Kikkoman) 1 yen, 40 sen; Middle upper grade (*jo no chu*) (3 makers including Yamasa) 1 yen 38 sen; Lower upper grade (*jo no ge*) (Kamibishi) 1 yen 25 sen; Upper middle grade (*chu no jo*) (Fujita) 1 yen 25 sen; Lower middle grade (*chu no ge*) (Chigusa) 1 yen 17 sen; Lower grade (*ge*) (Kinka) 80 sen. Yamaguchi Yoshibeï of Yamasa Shoyu starts to sell Worcestershire Sauce, called “Mikado Sauce.”

1885 May—The government reinstates the tax on shoyu to raise money for the army.

1887—Soybean production in Japan tops 400,000 tonnes (419,700 tons) for the first time.

1890—The Tokyo-Area Shoyu Brewers' and Wholesalers' Union (*Ichifu Rokken Shoyu Jozo-ka Tokyo Tonya Kumiai Rengokai*) forms a cartel for the first time because of a 50% increase in the price of their raw materials.

1891—Mogi Kenzaburo of Kikkoman (1st generation) starts to use a special press (*gendo maki assaku-ki*) invented by Yamazaki Izuko to press the shoyu out of the moromi mash more efficiently and quickly.

1893—In recent years the import of soybeans to Japan has increased rapidly, and this year it reaches 96,000 tonnes. These soybeans are grown mainly in Manchuria. The average price of 2 liters of high-quality shoyu in Tokyo is 10 sen. (In 1982 it is 584 yen, or 5,840 times more than in 1893).

1894—Around this time miso soup is recognized for its value as a protein food. Dr. Sato Nesaku, an agricultural specialist, says that miso is a farm household's milk.

1894—Yabe Kikuji (1868-1936) calls natto “Japanese cheese” and presents the first academic paper on natto bacteria in Japan.

1895—Around this time the number of walking vendors of tofu, natto, and boiled whole soybeans (*ni-mame*) increased, as did the production of dried-frozen tofu (*kori-dofu*). The number of small shoyu makers decreased dramatically as Kikkoman, Yamasa, and Higeta increasingly used advanced industrialized methods. Recipes and methods for making miso pickles (*miso-zuke*) using carrots, daikon, udo, and ginger are given in women's magazines such as *Jokan*, *Katei Zasshi* and *Jogaku Kogi*.

1896—Around this time the importation of salt starts, as shoyu makers in Noda and Chiba buy 15,000 tons of salt from England.

1897—Soybean imports this year increase to about 140,000 tonnes, which is one-fourth of Japanese

consumption. Domestic soybean production is 400,000 tonnes.

1899—Mogi Keizaburo of Kikkoman of Kikkoman (1st generation) starts using a boiler for the first time in the shoyu industry. Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

51. Sempolowski, A. 1900. Ueber den Anbau der Sojabohne [On soybean culture]. *Fuehling's Landwirtschaftliche Zeitung* 49(5):193-96. March 1. [Ger]

• **Summary:** “The soybean first aroused great interest in Europe after the Vienna World Exposition in 1873, where a large collection of soybean varieties from China, Japan, India, etc. were exhibited. Professor Haberlandt in Vienna and others subsequently conducted a large series of agronomic trials with the soybean in various locations from Austria and Germany. These, however, showed that the cultivation of this fodder plant in the districts concerned is not worth recommending since the soybean matured either very late or not at all. At that time I also conducted soybean agronomic trials in the province of Posen and in Russian Poland; these, too, gave negative results in those vegetation areas. The farmers were discouraged from cultivating the soybeans and pretty soon the once-popular fodder plant was indeed forgotten.

“However, in more recent years, there arose a new, eager apostle of the soybean, the farmer J. Owsinski [Owinsky, Ovinski] from the province of Podolia. He had been working for a long time in East Asia, allegedly, and there he learned about new, earlier-ripening varieties of this fodder plant. For cultivation, he recommends two varieties above all: one black- and one brown-seeded. Since the soybean still continues to have a great reputation, publicity, especially in Russia, as an excellent fodder plant, I decided to conduct another agronomic trial with these two new varieties at agricultural research station at Sobieszyn (in Russian Poland). I wanted to answer two questions: First the time required for the soybean to mature in our climate, and second the value of the entire plant as fodder.

According to Owsinski, the soybean took 100 days to come to vegetative maturity in southwest Russia and 110 days in western Russia, corresponding to late varieties of oats or blue lupins. The brown-seeded soybean is said to ripen in 100 days in southwest Russia and 108-110 days in western Russia, however the yield is low and the seeds shatter easily.

In East Asia soybeans are used to make soy sauce (“Shoya, Soohu, or Soy”), miso, and natto—the last two being fermented foods. A table shows the nutritional composition of soybean cake on a dry weight basis (41.73% protein, and 7.18% fat).

On 14 May 1898 the author planted his trial field with soybeans. On Sept. 22 he harvested 30 plants of brown-seeded soybeans, including 200 gm of seeds; 100 seeds

weighed 22.07 gm. The plants were 26-36 cm high and on each stem were 13-17 pods. The time to maturity was 140 days. On Oct. 5 he harvested 23 plants of black-seeded soybeans, including 208 gm of seeds; 100 seeds weighed 16.01 gm. The plants attained a height of 30-55 cm, and on each stem were 12-56 pods. The time to maturity was 173 days.

On 17 May 1899 the author planted a larger quantity of brown-seeded soybeans at the rate of 643 kg/ha in rows 40 cm apart. The time to maturity was 130 days. At the same time on another test plot he planted black-seeded soybeans in rows 50 cm apart. The harvest took place on Oct. 7 and the time to maturity was 170 days, but the seeds were not completely ripe and had to be dried for another week. A table shows the nutritional composition of these two varieties. Brown: 39.03% crude protein and 18.55% fat. Black: 37.62% crude protein and 20.87% fat.

“When we consider the protein and fat content of the seeds, we must acknowledge that the soybean, compared with other crops, has a very high nutritional value. However, farmers must be urgently advised to treat the new, allegedly early-ripening varieties with great caution, since they have not yet been sufficiently tested to be recklessly praised and their cultivation widely expanded.”

Note: This document contains the earliest clear date seen for soybeans in Russia, or the cultivation of soybeans in Russia (14 May 1898). This is also the earliest document seen that describes soybean breeding in Russia. The source of these soybeans was Owinski, who apparently obtained them from East Asia. Address: Dr., Sobieszyn [Russian Poland?].

52. Abel, Mary Hinman. 1900. Beans, peas, and other legumes as food. *Farmers' Bulletin (USDA)* No. 121. 32 p. See p. 9-11. Illust. Revised Nov. 1904. Corrected March 1906. [1 ref]

• **Summary:** A section titled “Soy Bean (*Glycine hispida*)” (p. 9-11) briefly describes the soybean plant and the rich nutritional composition of its seeds. The first paragraph is quoted from USDA Farmers' Bulletin 58.

Starting with paragraph 2: “This leguminous plant, probably native in China, is the most important legume of China and Japan... In the Orient this bean and the various food products made from it are so largely consumed that it is perhaps the most important food plant next to rice. The soy bean is eaten to a small extent boiled like other beans, but in China and Japan it is elaborated into a variety of products, all of which have a high percentage of protein, and when eaten in connection with the staple food, rice, which is so deficient in that constituent [protein], helps to make a well-balanced dietary. Some one of these products is eaten at perhaps every meal and by rich and poor alike, especially in the interior of these countries, where sea food is not obtainable.

“One of the most important of these preparations is

shoyu, and it is the only one that has been introduced to any extent into other countries, where it is known as soy sauce...

“There are also several varieties of bean cheese or similar products made from this legume which are very important foods. These are natto, miso, and tofu. Natto is made from soy beans that have been boiled for several hours until very soft, small portions of the still hot mass being then wrapped securely in bundles of straw and placed in a heated, tightly closed cellar for twenty-four hours. Bacteria, probably from the air or the straw, work in the mass, producing an agreeable change in its taste.

“For tofu, the soy bean, after soaking and crushing, is boiled in considerable water and filtered through cloth. To the resulting milky fluid 2 per cent of concentrated sea brine is added, which, probably by virtue of the calcium and magnesium salts present, precipitates the plant casein, which is then pressed into little snow-white tablets. It is made fresh every day. Tofu is sometimes cooked in peanut oil before it is eaten. In natto and miso the action of minute organisms plays an important part. In tofu there is no such action. The composition of a number of these products is as follows:”

A table (p. 11) shows the nutritional composition of food products made from soy beans, including fresh tofu, natto, white miso, red miso, Swiss miso, and shoyu (2 samples).

An illustration (non-original line drawing, p. 10) shows a soy bean plant with a cluster of 7 pods to its upper left (slightly changed from an original in Carrière 1880, p. 154).

This bulletin also discusses (with an illustration of each): The bean—Broad or Windsor bean (*Vicia faba*). Kidney bean (*Phaseolus vulgaris*). Lima bean (*Phaseolus lunatus*). Scarlet runner (*Phaseolus multiflorus*). Frijole (*Phaseolus spp.*). Cowpea (*Vigna catjang*). Lablab bean (*Dolichos lablab*) and other common varieties. Locust bean (*Ceratonia siliqua*).

The pea—Field pea (*Pisum arvense*). Garden pea (*Pisum sativum*). Chick-pea or gram (*Cicer arietinum*).

The lentil (*Lens esculenta*). The peanut (*Arachis hypogaea*).

Note 1. This is the earliest English-language document seen (Aug. 2011) that uses the term “milky fluid” to refer to soymilk.

Note 2. Mary Hinman Able was not an employee of the USDA or of the federal government. She was a pioneer in the fields of nutrition, nutrition education, home economics, and popularizing science for the general public. Between 1904 and 1913 she wrote several farmers bulletins for the USDA. From 1909 to 1915 she was editor of the *Journal of Home Economics*.

53. Boorsma, P.A. 1900. Scheikundig onderzoek van in Ned.-Indie inheemsche voedingsmiddelen. De sojaboon [Chemical analysis of some indigenous foodstuffs in the Netherlands Indies. The soybean]. *Geneeskundig Tijdschrift voor Nederlandsch-Indie* 40:247-59. [18 ref. Dut]

• **Summary:** Contents: Literature review. Introduction

(Boorsma is living in Java). Chemical composition of indigenous soybeans: Table giving figures (based on Boorsma’s original research) for large black, large yellow, small yellow, unripe or immature black soybeans, soy protein (*eiwit in de soja*) or legumine, the oil (*De vette olie*), analysis of the ash, starch, the black soybean (*zwarte kedeleh*), use of soybeans in Java and Japan. Japanese soy preparations (*Japansche soja preparaten*): Shoyu (soja) made with koji, tofu, yuba, miso and natto. Indigenous (Chinese) preparations: Tempeh (*tempe kedeleh*), Indonesian soy sauce (*Ketjap-Bataviasche soja*), tofu and pressed tofu (*Tao-hoe en Tao-koan*), Indonesian miso and fermented black soybeans (*Tao-tjo en Tao-dji*).

Note 1. This is the earliest document seen (Jan. 2012) in any language that mentions “Tao-dji.”

Note 2. This is the earliest Dutch-language document seen (Jan. 2012) that mentions fermented black soybeans, which it calls *Tao-dji*.

Note 3. This is the 2nd earliest document seen (March 2009) that mentions Indonesian-style miso, which it calls “Tao-tjo.” This is the earliest Dutch-language document seen (Feb. 2009) that uses the word “Tao-tjo” to refer to Indonesian-style miso.

The section titled “Japanese soy preparations” (p. 251-53) includes descriptions of koji, tofu, dried frozen tofu, yuba, miso and natto, as follows: Tofu is the Japanese name for a yellow-white to gray mass, which is prepared by macerating the finely ground up soybeans with water; an initial [natural] fermentation, which occurs alongside, creates enough acid to precipitate part of the protein. Then a short heating, causes as much fat as possible to bind to the protein, so that the liquid after filtration has a milky appearance. Through the addition of the highly alkaline magnesium concentrate, a by-product of making sea salt, the protein is precipitated, separated out by hand and shaped into cakes—which contain lots of water, protein and fat. As a side dish or in the preparation of soup, tofu is used a lot. To remove most of the water, it is common to freeze and dry the cakes in the sun afterward. Then they are called kori-tofu.

Yuba is an even fattier product obtained by the evaporation of the cream layer, that aggregates on the surface of the just mentioned bean milk.

In Japan, most soybeans are processed into cheese types, called miso and natto [which the author confuses in the following].

The cooked beans, that have been formed into a firm dough are fermented again with koji, kitchen salt and water. The temperature and the amount of kitchen salt, that one uses, affect the nature of the product [miso] and the speed of fermentation. Finally the mass is cooked for a long time in the brine, separated and shaped into cakes. The resulting vegetable cheese [natto] is then wrapped in bundles, of about 500 grams, of straw, and left to its own for a few days in a heated space; where, according to Loew [sic, Yabe 1895,

p. 438-39] the microbes attached to the straw cause an additional post-fermentation.

The reason for the somewhat extensive attention [in this writing] to the latter, is that the native soybean (katjang kedeleh) preparations of the Dutch East Indies are, more or less, patterned after the Japanese.

This excellent article contains a 4½-page description (the best seen to date, p. 253-58) of the traditional process for making soybean tempeh (*Tempe kedeleh*). The soybeans are parboiled, soaked in water for 2-3 days, drained, steamed in a steamer (*koekesan*), spread in a layer several centimeters thick on woven bamboo trays in shelves, and covered completely with banana leaves. They are then inoculated with the *bijang*, which is the “mold containing residues of a previous preparation.” This is mixed in here and there, then the trays are covered lightly with banana leaves so as to let in some air. “Rampant growth of the mold soon begins. In the evening the mass is molded a little and after two 24-hour periods one will obtain a coherent cake, which is cut into pieces and taken as is to the market.”

The cotyledons are stuck together by a dense mycelium, which has grown into a somewhat white covering. According to Prinsen Geerligts (cited above), the name of the mold is *Chlamydomucor Oryzae*.

During the two days of rampant mold growth, a radical conversion takes place in the components of the seeds; a lot of water, carbonic acid, and heat start to develop... A thermometer inserted into the fermenting mass shows a temperature 10-12°C above that of the environment.

As the preparation is finished, the banana leaves are taken away; the temperature drops slowly to normal, the rampant mold growth stops, and the mass dries out slightly. In this condition, the tempeh can be kept for several days without spoiling.

When the rampant mold growth is allowed to continue for a third day, simply by leaving the banana leaves in place, the conversion will soon become much stronger as noted by the formation of ammonia. Also poisonous products start to form; a monkey, given a little bit [of overripe tempeh] among his other foods that day was vomiting violently one hour later. Thus we should admit that the stories about poisonings caused by various sorts of tempeh [such as bongkrek, made from coconut presscake] probably have some foundation. But there is little fear of this from soybean tempeh.

After microscopic examination, Boorsma concluded that Prinsen Geerligts and others were wrong in stating that (1) the mold hyphae penetrate and dissolve the hard soybean cell walls, and (2) cellulose is decreased during tempeh (*tempe*) fermentation. He studied the chemical and compositional changes at four stages during a 3-day tempeh fermentation; a table shows his findings. He observed that fats and soluble carbohydrates decreased substantially, while nitrogen decreased only slightly. He also discussed the hydrolysis of soybean lipids, and why tempeh is easier to digest than

whole soybeans.

Note 4. This is the earliest Dutch-language document seen (Sept. 2011) that uses the term *tempe kedele* or the word *tempe* to refer to tempeh.

Note 5. This is the earliest document seen (Jan. 2012) that describes how to make tempeh on a commercial scale.

On page 258 Boorsma briefly discusses Ketjap (which he called *Bataviasche soja*, or Jakarta soy sauce) and Tao-hoe and Tao-koan (tofu and firm tofu), based on information from Prinsen-Geerligts (for both) and Vorderman (for firm tofu). For each he gives a nutritional composition. On page 259 Boorsma briefly discusses *Tao tjo* and *Tao-dji* (Indonesian-style miso and fermented black soybeans). Note 6. This is the earliest Dutch-language document seen (Dec. 1999) that uses the term *Tao tjo* to refer to Indonesian-style miso or tauco / taucho.

Note 7. This is the earliest document seen (April 2001) that contains the term *Tao-koan*.

Note 8. This is the earliest Dutch-language document seen (Jan. 2012) that contains the word *natto*.

Note 9. This is the earliest Dutch-language document seen (Oct. 2008) that mentions yuba, which it calls *Yuba* and describes as *een nog vetrijker product dat verkregen wordt bij uitdampen van de roomloog, die zich bij de zoeven genoende boonenmelk aan de oppervlatke verzamelt.*”

Note 10. Boorsma was a Dutch naturalist who lived in Indonesia in the early 1900s. Address: Netherlands.

54. Zavitz, C.A. 1900. Co-operative experiments in agriculture. *Ontario Agricultural and Experimental Union, Annual Report* 21:6-37. For the year 1899. See p. 9, 16, 31-32.

• **Summary:** A table (p. 7) shows the number of distinct experiments in agriculture, number of experimenters, and number of satisfactory reports each year for 1886, 1888, and 1891-99. For 1886 these numbers were 1, 12, and 8. For 1888 they were 1, 90, and 40. For 1891 they were 12, 203, and 126. For 1895 they were 15, 1699, and 513. For 1899 they were 23, 3485, and 739. Thus, during these 14 years the Union made remarkable progress.

A table titled “List of experiments for 1899” (p. 9), under “Grain crops” includes “Testing three varieties of Japanese beans—3 plots.”

In a long “List of experimenters” we read (p. 16) that the Japanese beans were grown by: (1) F.B. Doud, Branchton, Brant Co. (2) Simon Miller, Unionville, York Co. (3) Jno. D. Neilson, Thedford, Lambton Co. (4) O.A.C., Guelph, Wellington Co.

In the section titled “Conclusions” (p. 31-32), table 15 shows the results (based on 4 tests) of testing three leading varieties of Japan [soy] beans: Medium Green (estimated value 72), yielded 2.6 tons/acre of straw and 22.4 bu/acre of grain. American Coffee Berry (estimated value 100), 1.4 tons/acre of straw and 21.3 bu/acre of grain. Extra Early

Dwarf (estimated value 86), 1.1 tons/acre of straw and 12.7 bu/acre of grain.

The text immediately below the table explains: “The Soy beans [sic] (*Glycine hispida*) is a leguminous plant native of Japan and China, and ranks very high from a chemical point of view. The plant is an annual, erect in growth and branches profusely. There are a large number of varieties, nearly all of which are too late for the conditions of Ontario. The different varieties are distinguished largely by the time required for the plants to mature and by the color of the seed; the yellow, the green, and the black, being the most common. The Soy beans are used for green fodder, silage, hay, pasture, and as a soil renovator, and the grain is used as a feed for live stock. These beans have been used as a food for man from the earliest times in Japan and China, and more recently in the European countries. They are not used as a food by themselves, but are made into different complex forms, of which five are quite common among Japanese, namely: natto, tofu, miso, yuba, shoyu.

“Conclusions.

“1. The Soy beans gave very good results in the Union experiments in 1899.

“2. The medium green Soy beans which gave the largest yield of grain per acre of the three varieties tested over Ontario in 1899, is the latest of the three varieties.

“3. The American Coffee Berry was the most popular variety with the experimenters when yield, time of maturity, etc., were all taken into consideration.”

Note 1. This is the earliest report seen (Aug. 2002) in this periodical concerning soy beans. C.A. Zavitz is also secretary of the Ontario Agricultural and Experimental Union, and a member of its Committee on Agriculture (appointed at the last annual meeting).

Note 2. This is the earliest document seen (Jan. 2012) that mentions natto in Canada. Address: B.S.A., Director of Co-operative Experiments in Agriculture, O.A.C. [Ontario Agricultural College], Guelph [Ontario, Canada].

55. Sawa, S. 1902. Note on Hamananatto, a kind of vegetable cheese. *Bulletin of the College of Agriculture, Tokyo Imperial University* 4(5):419-20. March. [1 ref. Eng]

• **Summary:** “This peculiar product is prepared from soy-beans, as are also two other kinds of vegetable cheese manufactured in Japan, the *Miso* and the *Natto*; but it has a different flavour and taste, and lacks the slimy character of the common *Natto*. It is manufactured only in the central provinces of Japan—especially in those of Mikawa and Totomi, from which it finds its way all over the country. It has an agreeable salty taste and a peculiar odor somewhat resembling that of the fresh crust of brown bread. There is not any mycelium discernible with the naked eye. The soy-beans composing it form no compact mass, and are of a brown colour with a thin layer of a salty taste and a somewhat sticky consistency.

“In preparing this product, the soy-beans are well washed, boiled to softness, spread on straw mats, and mixed with wheat flour (6 liters flour to 10 liters soy-beans). Moldfungi will now develop, but soon afterwards this mixture is exposed to the direct sunlight for three days, probably to kill the fungi, and is then put into flat tubs. After 12-13 days some common salt and ginger are added. The entire mass is then kept in tubs under pressure for about thirty days.

“A portion, carefully freed from the pieces of ginger and particles of straw mats used in its manufacture, was dried, pulverized and sifted through a 0.5 mm sieve. I found the chemical composition of the dry matter to be as follows: Albuminoid nitrogen 3.57%. Crude fat 3.44%. Crude fibre 6.87%. Total carbohydrate excluding cellulose 8.40%. Total ash, including salt added 18.54%. The fresh sample contained 44.73% water and 55.23% dry matter.

“There exist at least three different kinds of bacteria in this product. The most numerous colonies on agar are of two kinds.” A detailed microbiological description is given.

Note 1. This is the earliest document seen, and also the earliest English-language document seen (Nov. 2011) that contains the word *Hamananatto* (or “Hamanatto”).

Note 2. This is the earliest English-language document seen (Jan. 2012) that uses the word “sticky” to describe natto.

56. Suda, Katsusaburô; Yoneki, Z. 1902. Nattô no bisei-butsu ni tsuite [On the microorganisms of natto]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* No. 242. p. 321-26. April. Special Conference Lecture (Rinji Taikai Enzetsu). [Jap]

• **Summary:** The authors believe that the microorganisms contained in natto consist of one sort of motile [mobile] and two sorts of immotile varieties. They predict that the varieties which take part in the fermentation of natto and cause the change in its chemical composition, producing thereby its characteristic smell and stickiness, are probably the motile and one of the immotile varieties. Address: 1. Sendai; 2. Joshu.

57. Koenig, Franz Joseph. ed. 1903. *Chemie der menschlichen Nahrungs- und Genussmittel*. Vol 1. *Chemische Zusammensetzung...* Ed. 4 [The chemistry of human foods and food adjuncts (stimulants / enjoyables). Vol. 1. Chemical composition... 4th ed.]. Berlin: Verlag von Julius Springer. 1535 p. See vol. 1, p. 97-98, 595-600, 638, 651-53, 1463, 1483-84, 1509. [31 ref. Ger]

• **Summary:** Summaries of early studies on the chemical composition of soybeans and various soyfoods, plus some original studies. Commercial sauces and Japanese shoyu (p. 97-98). Cites: Wein, Kinch, Anderson, Senff, Schwackhöfer & Stua, Zulkowski, Mach, Ulbricht, Wildt, Schröder, Blaskovics, Caplan, Pellet, Carriere, Kellner,



Jenkins, Becke & Cosack, Kornauth. Soybeans in Russia: Nikitin, Giljaranski, Lipski [Lipskii] (p. 1483-84). Address: Geh. Reg.-Rath, o. Professor an der Kgl. Universitaet und Vorsteher der Agric.-Chem. Versuchsstation Muenster in Westphalia, Germany.

58. Abel, Mary Hinman. 1904. Beans, peas, and other legumes as food. *Farmers' Bulletin (USDA)* No. 121. 39 p. See p. 11-13, 18-20. Revised. Illust. [1 ref]\*

• **Summary:** A revised edition, 3 pages longer than the 1900 original. The information about soy is unchanged, however it is on different pages (see above). The section titled "Nutritive value of the legumes" (p. 18-20) includes a table titled "Composition of fresh and dried legumes compared with that of other foods." Under "Dried legumes," the composition of "Soy beans" (dry, containing 10.8% water) is given.

59. Kadono, C. 1905. The diet of the Japanese. *Times (London)*. Feb. 11. p. 6, cols. 3-4.

• **Summary:** This article is actually mostly about soya beans and their products. "It is well known that the Japanese diet consists chiefly of rice, vegetables, and fish, with very small and occasional additions of butchers' meat. The relative quantities of these, and vegetables and products thereof used, would be interesting and in some respects instructive.

"The following bill of fare, which attempts to give the three meals of a day for a family of moderate circumstances, will show how they live. It may also be said that all Japanese live rather simply whether high or low in their station of life, and the menu can be taken as typical of all classes.

"Breakfast (about 7 to 7:30 a.m.).—Miso soup (with vegetables, tofu, &c.), pickles, boiled rice, tea (sometimes raw egg or boiled sweet soya beans, or natto, &c.).

"Lunch (12 noon).—Fish boiled in soya, vegetables stewed in soya, pickles, boiled rice, tea.

"Supper (6 to 6:30 p.m.).—Soya soup (with vegetables, fishes, &c.), raw fish sliced and eaten with soya sauce, broiled fish (or boiled) with vegetables (or butchers' meat or fowl and vegetables stewed), rice, tea...

"From the foregoing it can be seen how cereals and vegetables predominate in Japanese diet. Rice and miso and soya, as will be seen from the menu, form the predominant feature of the food, and it may not be an exaggeration to say that the Japanese physique is mainly built up on the products of soya beans, such as miso, soya sauce, tofu, &c."

There follows a detailed table titled "Analysis of Soya Beans and Their Products. (Extract from a table by Mr. C. Omura.)" Nutritional analyses are given for the following, written exactly as they appear: Soya beans (5 varieties), miso (white, red Osaka, red Tokio, red Sendai), soya sauce (regular or Noda), tofu, dried frozen tofu, fried tofu, mash residue from tofu (Okara), yuba (Dried skim off tofu-mash), natto (Steamed beans with surface fermentation).

"Soya beans are grown all over Japan and in Manchuria, and so far as I know cannot be had here [in England]. They are eaten boiled, either young or ripe." They are manufactured into those articles shown above, of which miso, soya, and tofu are the most important..." The author then gives a 5-10 line description for each of how miso, soya sauce, and tofu are made. Tofu is coagulated with a "strong brine. "The remnant (okara), being a white pulverized mass, called fancifully 'snow balls' by Japanese, is eaten boiled and seasoned with soya sauce.

"I have given Japanese meals to some English friends and most have pronounced the food excellent, and some have even braved the sliced raw fish with soya sauce."

Note 1. Concerning the idea that okara is sometimes fancifully called "snow balls," the term *kirazu* is written with three characters: yuki = snow, hana = flower(s), and sai = vegetable(s). Or the author may be referring to a local term from some part of Japan.

Note 2. This is the earliest English-language document seen (Oct. 2001) that uses the Japanese word *okara* or the term "mash residue from tofu" to refer to okara.

Note 3. This is the earliest English-language document seen (Nov. 2011) that contains the word "dried frozen tofu" (or "dried-frozen tofu"). Address: England.

60. *Manchester Guardian*. 1905. What the Japanese eat. Feb. 13. p. 12.

• **Summary:** This is a summary of: Kadono, C. 1905. "The diet of the Japanese." *Times* (London). Feb. 11. p. 6, cols. 3-4. Mentions soya beans, miso soup, tofu, natto, soya sauce, etc.

61. *Chambers's Journal (London)*. 1905. Japanese diet. Vol. 8. March 25. p. 270. Sixth series. [1 ref]

• **Summary:** "The nations of the world have now had the opportunity of learning many a valuable lesson from the general management of the Japanese army... It is interesting to note that the hard work done by the Japanese Tommy is performed on a dietary table which would hardly satisfy the soldiers of any other country. A large quantity of the Japanese soldiers' rations is made up of compressed fish-meal... Another form of food which seems peculiar to the Japanese army is obtained from kelp and other seaweeds, many of which afford very nourishing sustenance..."

"At home this is the bill of fare of a Japanese family in moderate circumstances, according to C. Kadono in the *Times*. Breakfast (about 7 to 7.30 A.M.)—miso soup (with vegetables, tofu, &c.), pickles, boiled rice, tea (sometimes raw egg or boiled sweet soya beans, or natto). Lunch (12 noon)—fish boiled in soya, vegetables stewed in soya, pickles, boiled rice, tea. Supper (6 to 6.30 P.M.)—soya soup (with vegetables, fish, &c.), raw fish sliced and eaten with soya sauce, broiled fish (or boiled) with vegetables (or butcher meat or fowl and vegetables stewed), rice, tea. The Japanese

physique is thus largely built up on the product of soya beans, which are grown all over Japan and in Manchuria, and from which miso, soya, and tofu are made. Soya beans, which, we believe, are not to be had in this country, are much richer in albumen than either beef or mutton. The Japanese diet, therefore, mainly consists of rice, vegetables, and fish, with very small and occasional additions of butcher meat.”

62. Seita, Masashi. 1905. Nattô no baikingaku-teki kenkyû [Bacteriological study of natto]. *Chugai Iji Shinpo (Medical News, Foreign and Domestic, Tokyo)* No. 590. p. 328. March. [Jap]  
Address: Tokyo Microscope Society (Tokyo Kenbikyô Gakkai Kôwakai).

63. Muto, Ryûnosuke. 1905. Nattô enchiimu no kenkyû [Studies on the enzymes of natto]. *Tokyo Iji Shinshi (Tokyo Medical Journal)* No. 1404. p. 665-76. April 8. [Jap]  
• **Summary:** According to Muramatsu (1912): Mr. Muto isolated several bacteria from natto and concluded that only one bacillus, belonging to the *B. subtilis* group, was necessary for the production of natto. Address: Japan.

64. Sawamura, Shin. 1905. Nattô no saikin ni tsukite [On the microorganisms in natto]. *Nogakkai Kaiho (J. of the Scientific Agricultural Society, Japan)* No. 67. p. 1-6. July. [Jap]  
• **Summary:** This is Sawamura’s earliest known paper concerning natto.

65. Oshima, Kintaro. 1905. A digest of Japanese investigations on the nutrition of man. *USDA Office of Experiment Stations, Bulletin* No. 159. 224 p. See p. 20-33, 40-43, 46-47, 145-53, 168-73. [26 ref. Eng]  
• **Summary:** One section titled “The Soy bean and its preparations” (p. 23-33) gives detailed discussions of tofu (including yuba, frozen tofu, kara [okara], and fried tofu), miso (incl. white miso, red or Sendai miso), shoyu, and natto. The nutritional composition of each is given, and many early studies by Western and Japanese scientists are cited.

“Next to rice in importance in the Japanese diet are legumes, which are universally used... Of the different legumes used as food in Japan, the soy bean (*Glycine hispida*) is by far the most important. According to agricultural statistics for the years 1879 to 1887, nearly 10 per cent of the cultivated land in Japan was devoted to the growth of this legume, an area somewhat larger than that devoted to wheat growing. In the northern Island [Hokkaido] in 1887 nearly 17 per cent of the total cultivated area was devoted to the soy bean. The average yearly production of soy beans amounts to about 360,000,000 kilograms... A part of the product is of course used for seed, and a not inconsiderable part is used as fertilizer.\*” (Footnote: \*)In northern China soy beans are used to some extent in the

production of oil, which is used for cooking and illumination [in oil lamps]. The residue from this process [the presscake] is imported largely into Japan, where it is used as a fertilizer”). Other legumes widely used in Japan include the mungo bean (*Phaseolus mungo radiatus*) and the adzuki bean (*Phaseolus mungo subtrilobata*) (p. 23-24).

“Many varieties of soy beans are known, being designated according to the color, size or shape of the seed, and the time required for maturity. For example, there are black, green, yellow, and white varieties, and these are again designated as early, medium, or late, according to the season of maturity, and small, medium, and large, according to the size of the seed. The black soy beans are used chiefly for cooking, with sugar and shoyu; the green variety is also used in this way, either in the fresh state or after being dried” (p. 24). There follows a long section on tofu (detailed in a separate record).

The “larger part of the leguminous food in the Japanese diet consists of the preparations of soy beans, such as miso, shoyu and tofu,...” (p. 46).

In Japan, legumes about 8% of the protein and 11% of the fat in the diet (p. 137). Many digestion experiments are described (p. 144-87), including those with tofu, shoyu, “tofu cake or kara, the soy-bean residue remaining from the preparation of tofu (see p. 26),” and yuba conducted in Japan by Osawa and Ueda (1887), T. Suchi (1887), Kano and Ishima (1899). Table 91 (p. 191) is a “Summary of results of digestion experiments with legumes and legume preparations.” The percentages given are “coefficients of digestibility.” Experiments No. 6 and 7—soybeans (average): Protein 65.5%, fat (uncertain), carbohydrates (incl. crude fiber) 85.7%. Experiments No. 8 and 92—tofu (average): Protein 92.7%, fat 96.4%, carbohydrates (incl. crude fiber) 93.3%. Experiment No. 94—“yuba (soy legumin coagulated):” Protein 92.6%, fat 95.7%, carbohydrates (incl. crude fiber) 86.6%, crude fiber 35.5%. Experiment No. 93—“tofu cake (soy-bean residue [okara]):” Protein 78.7%, fat 84.3%, carbohydrates (incl. crude fiber) 82.8%, crude fiber 89.6%.

Note: This is the earliest English-language document seen (Oct. 2001) that uses the Japanese word *kara* to refer to okara.

Other Japanese foods discussed include adzuki or adzuke beans (*Phaseolus mungo subtrilobata*) (p. 24, 170), dried algae (sea vegetables, p. 34), and kuzu (p. 170). Address: Director, Hokkaido Agric. Exp. Station, Sapporo, Japan.

66. Oshima, Kintaro. 1905. A digest of Japanese investigations on the nutrition of man: Natto (Document part). *USDA Office of Experiment Stations, Bulletin* No. 159. 224 p. See p. 33. [2 ref. Eng]

• **Summary:** “Natto has long been used by the Buddhists. It is prepared by boiling the soy beans in water for about

5 hours to render them very soft; the hot material is then wrapped in small portions in straw, and the bundles, tied at both ends, are placed in a cellar in which a fire has been kindled. The cellar is then closed for twenty-four hours and the cooked beans allowed to ferment in the warm, moist atmosphere. The fermented product is a thick viscid mass having a peculiar but not offensive odor. Four different micro-organisms\* (Footnote: \* “Yabe found 1 bacillus and 3 micrococci.”), the source of which is supposed to be either the straw or the air of the cellar, participate in the fermentation. The principal chemical change concerned in the ripening of natto taken place in the protein.

“In the water-free substance of natto, Yabe (1894) found the following percentages of nitrogen in different forms: Albuminoid nitrogen 4.03, peptone nitrogen 1.62, and amid nitrogen 1.89 per cent.

“The cleavage products leucin, tyrosin, and xanthin were also identified.” Address: Director, Hokkaido Agric. Exp. Station, Sapporo, Japan.

67. Abel, Mary Hinman. 1906. Beans, peas, and other legumes as food. *Farmers' Bulletin (USDA)* No. 121. 38 p. March 25. See p. 11-13, 18-20. Corrected. [1 ref]

• **Summary:** A corrected edition, one page shorter than the 1904 revised edition. On the cover, below the title is written “(Corrected March 25, 1906),” yet at the bottom of the same page the publication date is given as 1904.

The section about soy (p. 11-13) is titled “Soy bean (*Glycine hispida*) and its preparations,” but the information in that section appears to be the same as in the original 1900 edition, as is the illustration of the soy bean plant (p. 12) and the table on page 19.

68. Sawamura, S. 1906. On the micro-organisms of natto. *Bulletin of the College of Agriculture, Tokyo Imperial University* 7(1):107-10. [1 ref. Eng]

• **Summary:** “Natto is a kind of vegetable cheese prepared in Japan by fermentation of boiled soy-bean wrapped in rice straw and left for one or two days in a warm place. This product contains much mucilage filled with innumerable bacteria and it is the great viscosity that is especially esteemed with this cheese.”

“The microorganisms of *natto* consist in the beginning chiefly of bacilli, but on being kept for some time micrococci gain predominance.

The writer isolated various kinds of bacilli and micrococci from *natto* and observed their behavior in cultures on sterilised soy-bean.” A detailed description of the characteristics of each of the bacilli is given. To Bacillus No. 1 the author gave the name *Bacillus natto*. He considered it to be a new species.

Note: The author was the first to isolate *Bacillus natto* from natto and to give the microorganism responsible for the natto fermentation that name.

He considered the other to be a variety of *Bacillus mes. vulgatus*. He also believed that both bacilli were required to make good natto. *B. natto* was a motile and facultative aerobe. “Natto produced by this bacillus has a good taste and aroma, but is not of so strong viscosity [stickiness] as that produced by Bacillus No. 2. The colonies of Bacillus No. 1 appear always in large number when plate cultures from natto are made. Hence it become probable that this microbe exerts the chief action in the fermentation of natto.”

Soy-beans changed by Bacillus No. 2 “show a stronger viscosity but a less agreeable taste and aroma than those produced by Bac. No. 1.”

Bacillus No. 2 also produced a “diastatic enzym which was confirmed by formation of reducing sugar in bouillon containing starch. From these facts we can infer that natto may exert some beneficial action on digestion.”

Note 1. This is the earliest document seen that contains the term *Bacillus natto*, which refers to the natto bacterium. It is a milestone publication.

Note 2. This is the earliest English-language document seen (Jan. 2012) that uses the word “mucilage” or the word “viscosity” in connection with Japanese natto. Address: Imperial College, Tokyo, Japan.

69. Senft, Emanuel. 1906. Ueber einige in Japan verwendete vegetabilische Nahrungsmittel, mit besonderer Beruecksichtigung der japanischen Militaerkonserven [On some vegetable foods used in Japan, with special attention to Japanese military canned foods]. *Pharmazeutische Praxis* 5(12):481-91. [5 ref. Ger]

• **Summary:** Working for the German Food Administration, the author examined a number of preserved foods that had played an important role in helping Japan to win the Russo-Japanese war. He drew heavily on Loew (1895). “Widely distributed in Japan is a unique baked good, which is produced primarily from wheat gluten with only a little of wheat flour; it is called *Fu* (wheat gluten bread).

“A very important role is played by the soybean and the many diverse products made from it: Yuba, the vegetable cheeses tofu, natto, and miso, plus shoyu or soy-sauce (*Shoju oder Soy-Sauce*). Like the soybean, tofu and natto are rich in protein. They supply the protein lacking in rice.”

Also discusses fresh konnyaku, dried-frozen konnyaku, dried persimmons, sea vegetables (12 types in great detail, with an illustration of the cells of a kombu plant), and warabi (dried ferns). Address: Official of military medicines, Committee of military hygiene.

70. Singh, U Nissor. 1906. Khasi-English dictionary. Shillong [Meghalaya, India]: Printed at the Eastern Bengal and Assam Secretariat Press. 247 p. See p. 177, 236. 24 cm.

• **Summary:** Edited by Major P.R.T. Gurdon, I.A., U Dohory Ropmay, B.A., and U Hajom Kissor Singh.

Page 177: *rymbai-ktung*, a masculine noun is defined as:

“(Bot. *glycine soja*), a species of bean” [i.e., the soybean].

Page 236 The word ‘*tung rymbái*, a feminine noun, is defined as “bean which has been cooked and preserved and having a very disagreeable smell.”

Note 1. This is the earliest document seen (Jan. 2012) that mentions ‘*tung rymbái* or *tungrymbai*, an east-Indian fermented soybean food and a close relative of Nepalese kinema and Japanese natto.

Note 2. This is the earliest document seen (Jan. 2012) that gives the name of the soybean in Khasi as *rymbái-ktung*. Address: Shillong.

71. *New York Times*. 1907. Here is a Japanese bill of fare: Prof. Chittenden shows value of simple diet used in Japan. Aug. 11. p. SM5.

• **Summary:** A typical bill of fare of a Japanese family in moderate circumstances includes: “Breakfast (from 7 to 7:30 A.M.)—Miso soup with vegetables. Boiled rice, pickles, and tea. Sometimes raw egg or boiled sweet soya beans or natto.

“Lunch (12 noon)—Fish boiled in soya. Vegetables stewed in soya. Boiled rice, pickles, tea.

“Supper (from 6 to 6:30)—Soya soup. Vegetables. Raw fish sliced, eaten with soya sauce...”

“The miso, soya sauce, and *topi* [sic, *tofu*] are all products of the soya bean, on which, with rice, the Japanese physique may be said to be built up.” “Rice is the main foodstuff, with the soya bean a close second.”

Prof. Chittenden of Yale University notes that Japan’s “exploits in war have recently attracted the attention of the civilized world.” Yet the great majority of Japanese have “remained untouched by the prodigality of Western civilization.” Their “habits and customs still bear the imprint of simplicity and frugality.”

Since Japan defeated Russia in war, many observers have noted that “the people of no other nation... have greater powers of physical endurance, or greater bodily strength and agility...”

72. Nicolle, Maurice. 1907. Action du “*Bacillus subtilis*” sur diverses bactéries [Action of *Bacillus subtilis* on various other bacteria]. *Annales de l’Institut Pasteur* 21(8):613-21. Aug. [1 ref. Fre]

• **Summary:** A variety of *Bacillus subtilis* has a bacteriolytic power over the microorganisms that cause typhoid and cholera; in this way it can destroy these harmful bacteria.

73. Bloch, A. [Armand-Aron]. 1907. Le soja. Sa culture, sa composition, son emploi en médecine et dans l’alimentation [The soybean. Its culture, its composition, its use in medicine and in food]. *Bulletin des Sciences Pharmacologiques (Paris)* 14:536-51. Sept.; 14:593-606. Oct. [46 ref. Fre]

• **Summary:** A review of the literature drawing heavily on Egasse (1888), Trimble (1896 and 1897), and Williams & Langworthy (1897, revised 1899), and including many

others. Contents: Introduction (mainly a long history of the soybean worldwide, with emphasis on Europe). Chemical composition of the soybean. Chemical composition of the soybean plant.

Part II: Preparation of shoyu. Preparation of miso. Natto. Preparation of tao-yu ([Chinese-style soy sauce] a condiment made with black soybeans, hibiscus leaves, and *Aspergillus Wentii* mold) and tuong. Tofu and yuba. Other soyfoods, incl. soy coffee.

“We are presently looking everywhere for ways of giving economic value to our colonies. It seemed interesting to me to draw attention to the soybean, the Chinese bean (*le Soja, Haricot chinois*) which contributes a large part of the food of the people in China, Japan, and the Far East. Already in use in Indochina, tested in Europe with success then abandoned for no apparent reason, the soybean could acclimatize itself in other colonies of ours, particularly in Madagascar, and perhaps in certain of our African possessions, and therefore could contribute to increasing their riches and the well being of their indigenous peoples.”

Soy oil “can be extracted partially by pressure or completely by ether or petroleum ether. It is yellowish red with a not particularly disagreeable odor.”

Mr. Lailleux, a former intern at the hospital in Algiers, has reported that a certain number of diabetic Arabs under treatment at the hospital of Dey, in Algiers [Algeria], have been helped by a dietary regimen based on soybean pap.

Note: This is the earliest document seen (Aug. 2009) concerning soybeans in connection with (but not yet in) Madagascar. Address: Pharmacist major 2nd class of the colonial troops. Doctor of pharmacy.

74. Gurdon, Philip Richard Thornhagh. 1907. The Khasis. London: David Nutt. xxvii + 227 p. See p. 172. Introduction by Sir Charles Lyall, K.C.S.I. Illust. 23 cm. [37\* ref]

• **Summary:** Soybean is not mentioned in the section on “Agriculture” (p. 39-43), or the section on “Crops” (p. 43-48), or the section on “Food” (p. 51-52).

However in the section on “Folk-tales” (p. 160-67) the fermented food named *tungrymbai* seems to be mentioned on page 172. The tale is written in the native language on the right side of the page with a parallel translation on the left. “How the Dog came to live with Man. In olden days, when the world was young, all the beasts lived happily together, and they bought and sold together, and they jointly built markets. The largest market where all the beasts used to take their articles for sale was ‘Luri-Lura,’ in the Bhoi country. To that market the dog came to sell rotten peas. No animal would buy that stinking stuff. Whenever any beast passed by his stall, he used to say “Please buy this stuff.” When they looked at it and smelt it, it gave out a bad odour. When many animals had collected together near the stall of the dog, they took offence at him, and they said to him, “Why have you come to sell this evil smelling, dirty stuff?” They then kicked

his ware and trampled it under foot.

Note 1. The term “rotten peas” may well refer to fermented soybeans, resembling Nepalese *kinema*. The term “stinking stuff” is a translation of *tung rymbái*, the name of a fermented soybean food which is today (Sept. 2010) often written / transliterated as *tungrymbai*. Note that the sequence of letters in the two words is identical if we disregard the accent on the letter “a.” Moreover, in contemporary writing on the fermented foods of north-east India, *tungrymbai* is almost always said to be a food from the Indian state of Meghalaya.

According to Wikipedia (Sept. 2010): “The Khasi people are a scheduled tribe, the majority of whom live in the State of Meghalaya in North East India, with small populations in neighbouring Assam, and in parts of Bangladesh.”

In *Khasi-English Dictionary*, by Nissor Singh (1906, 247 p.), the word *tung rymbái*, a noun, is defined (p. 236) as “bean which has been cooked and preserved and having a very disagreeable smell.” We now know that the bean was actually a soybean and that it was fermented with bacteria of the genus *Bacillus*.

Note 2. This is the 2nd earliest document seen (Sept. 2010) that mentions *tung rymbái* or *tungrymbai*, an east-Indian fermented soybean food.

Note 3. This is the 2nd earliest document seen (Oct. 2010) concerning soybeans in Meghalaya. Since this traditional fermented soyfood was made in Meghalaya, it seems highly likely soybeans also grew and probably were cultivated in Meghalaya. Address: Major, I.A., Deputy Commissioner Eastern Bengal and Assam Commission, and Superintendent of Ethnography in Assam.

75. Royal Botanic Gardens, Kew [England]. 1907. Official Guide to the Museums of Economic Botany. No. 1. Dicotyledons. Third edition, revised and augmented. London, Printed for H.M. Stationery Off. by Darling... 236 p. See p. 65. 19 cm.

• **Summary:** Page 65 states: “No 192. Soy beans (*Glycine hispida*, Maxim.). An annual, cultivated largely in China, Japan, and India. In the two former countries a sauce known as Soy is produced in large quantities and in Japan a kind of cheese or curd cake is prepared known as ‘Natto.’ The chief products of Manchuria are bean oil and bean cake. The seeds yield 17 per cent. of an edible oil obtained by expression, and the residue is made into large circular cakes, weighing about 60 lbs, similar to that exhibited, used in the East for feeding cattle and also as manure. Soy is imported into Europe in barrels and is said to form the basis of most of the popular sauces.”

Also discusses “Ground nuts. Pods and seeds of *Arachis hypogaea*, L.” (p. 63, No. 188), and Kuzu (*Pueraria thunbergiana*, p. 66-67, No. 195). Address: Kew, England.

76. Sawamura, Shin. 1907. On the microorganisms of natto.

*Zentralblatt fuer Bakteriologie. Series 2.* 19(10/12):335-36. [1 ref. Ger]

• **Summary:** German summary of a 1906 article by Sawamura from *Bulletin of the College of Agriculture, Tokyo* 7(1):107. “Natto is a type of vegetable cheese which is made from cooked soybeans by a process of fermentation.” Address: Japan.

77. Senft, Emanuel. 1907. Ueber einige in Japan verwendete vegetabilische Nahrungsmittel, mit besonderer Beruecksichtigung der japanischen Militaerkonserven [On some vegetable foods used in Japan, with special attention to Japanese military canned foods]. *Pharmazeutische Praxis* 6(3):81-89; 6(4):122-24, 131-32; 6(6):211-12, 219. [19 ref. Ger]

• **Summary:** These three sections contain a good review of the literature (especially the Japanese literature) in German. Issue No. 3 begins with “Phanerogams. Chapter 5. Legumes. Soybeans and soybean preparations” (p. 81-89). Contents: Introduction. Varieties: Group I. Soja platycarpa-Harz (5 forms—olivacea-Harz and punctata-Harz, melanosperma, platysperma, parvula Martens). Soja tumida-Harz (3 forms—pallida Roseb. [sic, Roxb = Roxburgh], castanea-Harz [brown], atosperma-Harz). Anatomy and cell structure of different parts of the plant and seeds. A non-original illustration (line drawing; p. 83) shows a soy bean, full-size and at cellular levels. Haberlandt and the Vienna World Exposition of 1873. Foods made from soybeans in China and Japan described by Charles Bryant (1785): Miso, soy sauce (*sooju-sauce* or soy), Roos, Koji. Tofu, sake. Shoju or Soja-Sauce. Miso (vegetable cheese; “Recently the firm Jul. Maggi & Comp. in Kempthal makes a type of miso and sells it commercially”).

Issue No. 4 begins with “Natto and tofu” (*Bohnenkäese*) (p. 122-24) and includes fresh tofu and frozen tofu (*gefrorener tofu*). Yuba. A separate section on miso pickles (*Misozuke*; p. 131-32) describes the different types, especially those made with daikon (*Rettiche*).

Issue No. 6 discusses shoyu (called *Extrakt-Sauce Japonica*, or Shoju-Sauce) (p. 211). A table (p. 212) lists the main food plants of Japan, including five different “varieties” (“var.”) of soybeans: *Kuro-mame*, *Shiro-mame*, *Ao-mame*, *Goishi-mame*, *Gankui-mame*. A photo (p. 219) shows various Japanese preserved foods, including a metal box containing “Fukujinsuke” [*fukujinzuke*] consisting of sliced vegetables (cucumbers, bamboo shoots, onions) preserved in soy sauce. Address: Military medicine official, Germany.

78. Lipman, Jacob G. 1908. Bacteria in relation to country life. New York, NY: Macmillan Co. xx + 486 p. See p. 231, 245, 258. Sept. Illust. Index. 20 cm.

• **Summary:** Chapter 23, titled “Soil-inoculation” (p. 221+) begins with a discussion of the early research of Hellriegel and Wilfarth, tests concerning legume nodules conducted in

1887 at the Moore Experiment Station at Bremen, Germany, and the development in Germany of “pure cultures” and of Nitragin followed by many disappointments from 1896-1898, “which cast discredit on artificial cultures.” Yet there is now hope that they will be made to succeed.

The section on “Soil-inoculation in the United States” states (p. 230-31) that at first, crops such as clovers, cow-peas, field-peas, etc. did not appear to require any inoculation. “It was otherwise with at least two leguminous crops, soybeans and alfalfa. Soybeans, originally introduced into the United States from Japan, did not do very well. They frequently failed to develop that healthy, dark green color characteristic of vigorous leguminous plants. Careful examination showed their roots to be devoid of tubercles. Soybean earth, straw and chaff were obtained from Japan and placed in the ground together with the seed. The plants thus inoculated developed normally and produced an abundance of tubercles.

“This experience demonstrated the need of soil-inoculation of soybeans. Many cases are reported in experiment station literature in which these inoculations gave positive results. For instance, in the experiments of the New Jersey Station, on light sandy soils at Hammonton, when cowpeas and soybeans were planted in the same ground, the former grew luxuriantly and gathered nitrogen from the air by means of their numerous nodules, while the soybeans remained small and yellow and produced no tubercles. It was not until the introduction of some soil from a field where these plants had been grown successfully for several years that the soybeans developed properly and grew as luxuriantly as did the cowpeas.

“Similar observations were made time and again in the case of alfalfa.” Figure 38 (three photos, p. 224) shows three soybean plants and their roots: (a) the largest, with nodules on the roots, is inoculated with soil; (b) medium size with no root nodules, is untreated; (c) thin and with no root nodules, is “inoculated with soybean chaff.”

Note 1. This is the earliest English-language document seen (June 2011) that contains the term “soybean chaff.” It refers a by-product that results when soybeans are threshed or the seeds cleaned.

In the Chapter 24, titled “Green-manuring” we read (p. 245): “The cowpea, soybean, and velvet bean as green-manure crops.—On the sandy soils of the East, the cowpea, soybean, sand vetch, crimson clover, and velvet bean have been widely used for improvement of the land. In the cotton-growing states of the South, the cowpea is almost indispensable as an aid in the maintenance of the humus and nitrogen of the soil.” Soil bacteria decompose the vines and roots. “The soybean, which is related to the cowpea, has also been used as a green-manure on light soils. It does well, however, also on heavier soils, provided it is properly inoculated, and is not as readily injured by cold weather.”

A full-page black-and-white photo (p. 258) shows “A

thoroughly inoculated crop of soybeans” growing in a large field.

Chapter 1, titled “The rise of bacteriology” (p. 1-12) gives an interesting, early history. Leeuwenhoek (lived 1632-1723) in Holland first beheld bacteria with his lenses in 1675; he called them “animacules.” “He recognized differences in their appearance and size as well as in their mode of motion.” These and subsequent observations “gave rise to much speculation and heated discussion concerning the relation of the animacules to animal diseases”—and to the issues of contagion and spontaneous generation. Belief in spontaneous generation had existed since the Middle ages, and the discovery of bacteria seemed to support the ancient theory. But various experiments from 1765 to 1875 gradually disproved the theory.

“The physiology of bacteria.—Pasteur’s epoch-making investigations on fermentation shed a broader light on the activities of microorganisms. His work plainly indicated that the various kinds of bacteria possess specific functions and differ in the chemical changes which they produce. This work may, therefore, be regarded as the starting point for much fruitful research... Bacteria were to be distinguished, henceforth, not by their appearance alone, but by the chemical transformations of which they are capable. They were to be regarded as chemical agents of wide significance, builders and destroyers in vegetable and animal substances, in organic and inorganic materials, in the presence or absence of air.

“*Bacteria as a cause of disease.*—The study of bacteria, and of other microorganisms, as agents of decay, putrefaction and fermentation, gained in interest with the recognition that bacteria may also be the specific cause of disease. As far back as 1762, the belief was expressed by Plenciz, a Vienna physician, that disease is the result of infection by animalcules; and, more important still, that every disease has its particular germ. The views of Plenciz met with no acceptance, and were soon forgotten amid the clashing opinions on spontaneous generation” (p. 6).

During the 1800s important advances were made by Bassi, Henle, Pasteur, and Lemaire. Lister developed a method of antiseptic surgery (1868), “through which medical science has achieved splendid results.” “The investigations of [the German bacteriologist Edwin] Klebs during the Franco-Prussian War [July 1870–May 1871] traced the entrance and development of bacteria in wounds and their passing into the circulatory system. Klebs and other investigators also noted the constant presence of bacteria in diphtheric infections.” “The systematic study of bacteria was furthered by the work of Schroeter, published in 1872.” Ferdinand Kohn then articulated the “opinion that, among bacteria, as among more highly organized organisms, there exist definite species fairly constant in their structure and in their physiological activities.”

“*Anthrax bacillus.*—In 1876, [the German Robert] Koch

[1843-1910] demonstrated clearly and convincingly that anthrax in cattle is due to a specific germ, and thus confirmed a fact already, indicated by the observation of others. He isolated the anthrax bacillus in pure culture, studied it under the microscope, and showed that he could produce anthrax in other animals by inoculation from such cultures” (p. 8).

“In agriculture, the development of bacteriology has given us a new insight into the nature of soil fertility. We have learned to regard the soil as a culture medium with its almost endless number of species...” We have also “made some progress towards successful systems of soil-inoculation.”

Chapter 47, titled “Bacteria in miscellaneous agricultural industries,” states (p. 456-57): “The preparation of natto.—Natto is a vegetable cheese made in Japan by fermenting boiled soybeans. The fermenting mass is kept in a warm place for one or two days, at the end of which time it has become filled with vast numbers of bacteria. The material is then found to contain a large proportion of a mucilaginous, viscous substance, which is highly esteemed by the Japanese.”

Note 2. This is the earliest English-language document seen (Jan. 2012) that uses the word “mucilaginous” or the word “viscous” to describe Japanese natto.

“The bacterial flora of natto consists at first largely of bacilli, but subsequently spherical forms become prominent.

“Two rod-shaped organisms, isolated by Sawamura, were found to change boiled soybeans into a product similar to natto. One of these produced the characteristic taste and aroma, but did not develop a strong viscosity in the beans. The other organism was found to possess a more pronounced ability to form mucilaginous materials, but did not develop as desirable a taste and aroma. The changes produced by these organisms in the preparation of natto were shown to be due to enzymes secreted by them.”

Note 3. Although the date on the title page of some editions is 1911, the copyright page and last page of the Preface indicate that it should be Sept. 1908.

Facing the title page (frontispiece) is a painted portrait of Anton Van Leeuwenhoek (pronounced lay-ven-hook), a Dutch naturalist (1632-1723), who is generally cited as the first to discover bacteria [or microorganisms]. Address: A.M., Ph.D., Soil Chemist and Bacteriologist, New Jersey Agric. Exp. Station, New Brunswick, New Jersey, and Assoc. Prof. of Agriculture at Rutgers College.

79. Watt, George. 1908. Commercial products of India. Being an abridgment of “The Dictionary of the Economic Products of India.” London: John Murray. viii + 1189 p. See p. 564-65. [15 soy ref]

• **Summary:** Since Watt’s *Dictionary of the Economic Products of India* has been out of print for some time, the Government of India asked him to write an updated 1-volume abridgement. He said that soybeans in India were first introduced from Indonesia. “The Soy Bean; in Indian

vernaculars, *bhat, ram, gari-kulay, hendedisom horec, pond disom, an-ing-kiyo, tzu-dza, bhatnas, seta, musa, khajuwa,* etc.

“A sub-erect or creeping annual native of China, Cochin-China, Japan and Java, comparatively recently introduced into India, though recorded as acclimatised and even seen as an escape from cultivation. It might, in fact, be described as extensively cultivated, though more as a garden than a field crop; is especially prevalent in Eastern Bengal, Assam (Barpeta Sub-division), the Khasia hills, Manipur, the Naga hills and Burma. It is not infrequent in the plains of India proper, especially in Busti, Gorakhpur, Patna and Purnea, etc. In Bombay and Madras, however, the Soy Bean has apparently hardly passed the experimental stage.

“Cultivation.—Two chief varieties occur, one called white, the other black. On the plains it is generally grown by itself as a *kharif* (autumn) crop. The seeds are sown from June to September, and harvested from November to December... In Assam it is sown with *áhu* (autumn rice) in April and May. The *áhu* crop is removed in July and August, and its stubble acts as a support for the bean plants, which are ready for harvest in December and January.”

“It is eaten in India in the localities where it is cultivated, chiefly in the form of *dál* or *satú*. In Japan it is largely used as a sauce, cheese (*natto*) or paste, and in China an edible oil is obtained from the seed. If cut when the pods are fully formed it makes a most nutritious fodder, and the seed-cake, as already stated, is an extremely rich cattle food.”

Also discusses: Alfalfa (p. 778). Almonds (*Prunus amygdalus*, p. 905). Broad bean or Windsor bean (*Vicia faba*, p. 1106-07. “There are two distinct forms, the long-podded and the broad-podded, the latter originating the name ‘Broad’ or ‘Windsor bean’”). Chufa (*Cyperus esculentus*, p. 465; also called Rush-nut, earth-almond, or tiger-nut). Coffee (p. 363-68, with an excellent history). Cowpeas (p. 1107-08). Lucerne or alfalfa (*Medicago sativa*, p. 778-79).

Mung bean, *udid*, and *urud / urd* (*Phaseolus mungo* or *P. radiatus*, p. 880-82). “There has been some confusion regarding the nomenclature of *Phaseolus Mungo* and the species which follows—*P. radiatus*,—due chiefly to Roxburgh having transposed the original Linnean names. *P. Mungo*, Linn., is the present plant, *udid* or *urd*; while *P. radiatus*, Linn., is the plant known in the vernacular as mung. There are two varieties of *udid*, one with large black seeds, the other with smaller greenish seeds, and these correspond very possibly with *P. Mungo* proper and the variety *Roxburghii*.

Sea-weeds (Kelp, p. 50). Address: Kew Gardens, England; Formerly, Prof. of Botany, Calcutta Univ., Superintendent Indian Museum (Industrial Section) and reporter on economic products to the Government of India.

80. Holland, Edward B. 1909. Soy beans and soy bean oil. *Massachusetts Agricultural Experiment Station, Annual*

Report 21(Part II):111-19. Jan. 1909. [30 ref]

• **Summary:** Contents: Economic uses. The chemistry of soy bean meal. Table showing composition of Medium Green soy beans. Soy bean oil: Physical tests (tables show specific gravity, specific viscosity, refractive index, mean dispersion), chemical tests (tables show acid number, ether number, Hehner number, insoluble acids, neutralization number, mean molecular weight, iodine number).

The oil was removed from the soy beans by the V.D. Anderson Company of Cleveland, Ohio, using torsional pressure. "An analysis of the resulting cake indicates that from 55 to 60 per cent. of the oil was removed. The oil was passed through a filter press, but was not refined otherwise. The oil was clear and of a dark amber color, with an odor similar to that of other vegetable oils." The author found the oil to have following physical constants: Specific gravity at 15°C 0.9206. Specific viscosity 8.43. Refractive index at 20°C 1.4749. Mean dispersion at 20°C 0.00938.

In chemical tests, the author found the following constants: Saponification (*Koettstorfer*) number 191.95. Acid number 1.27. Ether number 190.68. Iodine number 130.77. "According to the classification of Lewkowitsch, based on iodine number, soy bean oil is a semi-drying oil of the cotton-seed oil group."

Note 1. E.B. Holland is no relation to J.H. Holland of London, who wrote about soy in 1910.

Note 2. This is the earliest English-language document seen (Sept. 2006) with the term "soy bean oil" in the title.

Note 3. This is the 2nd earliest document seen (Sept. 2006) that uses the term "Refractive index" in connection with the soja bean, and the first that gives a value (1.4749 at 20°C).

Note 4. Values for the specific gravity and saponification number of soy bean oil, attributed to Shukoff in "correspondence with Dr. Lindsey," are the same as those published by Shukoff in *Chemische Revue ueber die Fett- und Harz-Industrie* (Hamburg, Germany) (Dec. 1901, p. 250-51). Address: M.Sc., Assoc. Chemist, 28 North Prospect St., Amherst, Massachusetts.

81. Rühräh, John. 1909. The soy bean in infant feeding; Preliminary report. *Archives of Pediatrics* 26:496-501. July.

• **Summary:** This pioneering paper was read before the Twenty-first Annual Meeting of the American Pediatric Society, Lenox, Massachusetts, May 28, 1909. "The soy bean (*glycine hispida*), sometimes incorrectly called the soja bean, is an annual leguminous plant which originally grew in a wild state from Cochin China to the south of Japan and Java."

There follows a brief but accurate history of the soy bean. "In 1875 Professor Haberlandt began a series of investigations with this plant in Austro-Hungary, and in his work published in 1878 he urges the importance of the soy bean as a food both for man and animals. After his death,

which occurred in 1878, very little notice was taken of the soy bean in Hungary and the prophecy that he made for its future failed."

"As early as 1829 Thomas Nuttall wrote an article in the *New England Farmer* concerning the bean as a valuable crop for this country. The Perry expedition to Japan also brought back soy beans, but until the last fifteen or twenty years the plant was known only as a curiosity."

"The plant is grown in America, but is used chiefly for the purpose of a forage crop and comparatively little reference has been made to its use as food for man." The plants "bear a remarkable number of beans and the flowers are self-pollinated, making the yield independent of insects. The bean may be easily grown in Maryland. I am indebted to three friends for experimenting with this plant in their gardens and obtaining good crops..."

Note 1. This is the earliest document seen (May 2009) that mentions soybean pollination—quite remarkable since it is by a pediatrician writing about a completely different subject. It is also the earliest document seen (May 2009) that uses the term "self-pollinated" (or self-pollinating, etc., with or without the hyphen) in connection with soybeans.

"At the present time there are seven varieties handled by seedsmen, and some twenty-two distinct varieties are known." The varieties Mammoth Yellow, Hollybrook, and Ito San have been used in infant feeding experiments. "The other varieties are the Guelph (green), the Samarow (green), the Ogemaw (brown), and the Buckshot (black). All of these latter may be grown in the north."

"I am indebted to Mr. Frank N. Meyer, agricultural explorer for the Department [U.S. Department of Agriculture], for information concerning the use of the beans in the East... The light-colored beans are eaten in soups and the pods are sometimes picked green, boiled, and served cold with a sprinkling of soy sauce. The green varieties are often pickled in brine and eaten moist or dried with meals as promoters of appetite; the same varieties are often slightly sprouted, scalded and served with meals in winter time as a green vegetable." Also discusses soybean oil, soy bean milk (which "has a composition nearly the same as that of cow's milk" as shown in a table), "natto, tofu, miso, yuba, shoyu..." (p. 498).

"The soybeans are sometimes roasted and then used as a substitute for coffee" (p. 499)

"The fact that the soy beans contain little or no starch suggested to Dujardin-Beaumetz that they be used as a food for diabetics. The soy bean flour has been placed on the American market, but was withdrawn owing to the fact that according to the manufacturers it contained 8 per cent. carbohydrate. It contains much less carbohydrate, however, than any of the other diabetic foods."

"As regards the use of the beans in infant feeding it seemed to me that soy bean gruel or milk, either alone or with cow's milk, might be of value in feeding several classes



of cases, viz., of marasmus and malnutrition, as a substitute for milk in diarrhea, and in intestinal and stomach disorders, and in diabetes mellitus.”

Note 2. This is the earliest document seen (July 2008) that suggests the use of a soybean preparation as a milk substitute for infants.”

Note 3. This is the earliest document seen (Aug. 2003) concerning the actual feeding of soymilk to infants or children, or concerning a soy-based infant formula. The author was the world’s first pediatrician to use soybeans in infant feeding, and did the first U.S. studies with soyfoods and human nutrition.

Note 4. This is the earliest English-language document seen (Oct. 2003) that uses the term “substitute for milk” to refer to soymilk. Note 5. This is the earliest English-language document seen (Nov. 2002) that uses the word “malnutrition” in connection with soyfoods.

The writer had hoped to conduct experiments and make a more complete clinical report but several misfortunes attended his efforts to secure the beans. “My first crop was eaten by rats, my second moulded in the pods owing to some unusually damp weather, and insects ate about two-thirds of my last crop. Fortunately, the beans may now be obtained from Messrs. T.W. Wood & Son, Richmond, Virginia.

“So far the gruel has been prepared by soaking the beans over night, stirring to remove the envelope surrounding the bean. Three times the amount of water is added to the beans and they are boiled until a smooth gruel results. This is strained if necessary [to make real soymilk]. This has the odor and taste of malt, but with the addition of a little salt is well taken, especially after the first bottle or two. The gruel is retained unusually well and seems to be easily digested. The stools are not more frequent than with other foods. The stools are light brown in color like those from malted milk. This soy bean gruel has nearly the same food value as milk and for certain children may need further dilution. About the same size feedings should be used as if milk were being given. Five percent sugar may be added to increase the fuel value.

“I have not used the beans in a sufficiently large number of cases nor over sufficient periods of time to justify any further statements at this time, but I do feel that properly used they will be a most valuable addition to the dietary of the sick infant. Grinding them to a bean meal would simplify matters very much, and, if success attends their use, a soy bean meal could easily be prepared.

“I hope to be able to make a second report at the next meeting and have called your attention to the bean in hope that other members may try them and report at the same time.”

Note 6. Pediatrician Herman F. Meyer (1960, p. x) published a long poem by Dr. John Ruhrah titled “A Simple Saga of Infant Feeding,” which described the history and present status of infant feeding. Meyer described Ruhrah as a

“philosopher, teacher, poet, pediatricist [pediatrician] and able historian.”

Note 7. This is the earliest English-language document seen (Oct. 2001) that uses the term “soy bean flour.”

The following photo of Dr. John Ruhrah (1872-1935) was taken in about 1914. Born in Chillicothe, Ohio, he was a graduate of the College of Physicians and Surgeons (Baltimore, 1894), did post-graduate work at Johns Hopkins, the Pasteur Institute, Paris (1897), and in other European schools (1900-1901), and was quarantine physician of the port of Baltimore (1898-1900), where he became Professor of pediatrics in the University of Maryland Medical School and in the College of Physicians and Surgeons.

His autograph is shown below. Address: M.D., Baltimore, Maryland.

82. Carson, John M. 1909. Soya bean and products. *Special Consular Report (U.S. Bureau of Manufactures, Department of Commerce and Labor)* No. 41. Part 5. 35 p. Erroneously numbered Special Consular Reports, Vol. XL.

• **Summary:** Contents: Introduction. I. Countries of production. China: Newchang (Varieties of beans and amount produced {in centals [hundredweights; 1 cental = 112 pounds]}, methods of cultivating and harvesting, prices and exports, shipments to Europe—use by natives), Dalny (Manufacture of bean cake and oil, preparing the cake, expressing the oil and wages paid, freight charges to Dalny, exports, stock on hand, and prices), Chefoo (Beans imported for cake manufacture, quantity and value of output, bean vermicelli made by a peculiar process [from the small green bean lü tou {mung bean}], preparation of beans, drying of product and prices [for vermicelli]), Shanghai (Extent of export trade in beans), Shantung (manufacture of bean oil and cake, harvesting and pressing, shipping and prices), Swatow, Tientsin (Exports of raw beans, shipments of bean cake, extent of trade at Tientsin). Tables (p. 5) show prices and exports of soya beans, bean cake and bean oil at Newchang for the years 1905-1908. Japan: Cost of production and prices (of soya beans, quite detailed), imports of beans and cakes, use of the bean as food (shoyu, miso, tofu, koya-tofu, natto, flour), Kobe (Beans as human food {eaten boiled with a little soy [sauce], “made into bean curd, and a kind of sauce made of wheat, beans, and salt”}—small exports {“The total exports of beans, pease, and pulse [incl. soy] in 1908 were valued at \$25,971, of which about \$24,000 worth went to Hawaii, the United States, and Canada for use by the Japanese residents in those countries as an article of food”}, manufacture of cake), Nagasaki (Production of beans, imports of beans—market prices). Shipments from Vladivostok \* [Russia, of soybeans probably grown in Manchuria] (Fluctuations in prices, shipments during present season, immense shipments planned next season (by Mitsui)).

“It is the intention of Mitsui Bussan Kaisha, the largest

exporter from this port, to ship about 200,000 tons of beans via Vladivostok during 1909 and about double that quantity via Dalny. Many large contracts have been made for next season, and from present indications a strong effort will be made against the control of Mitsui Bussan Kaisha as the Chinese are making arrangements to deal direct with the European market without the aid of the Japanese” (p. 18).

Tables show: The quantities and value of soya beans, soya-bean cake, and bean oil imported into Japan during the year 1908 (p. 15). The soya bean harvests (in bushels) reported in various Japanese districts (p. 16).

II. Markets. Denmark: Experimental imports made, views of an importer. France: High duties prevent importation of soya beans, soya-bean flour bread used by diabetics, unknown in Calais district. Germany: Danger of feeding cattle on soya-bean products, oil value—prices at Hamburg, comparative food value of the bean. Italy: Beans imported and cultivated in limited quantities, prices of soya products—American cotton-seed oil, not imported into Catania, home products supply Piedmont district. Netherlands: A great future for the soya-bean trade predicted, prices of the bean and bean cake, soya cake as cattle feed, manufacture of soya-bean products begun, English soya-bean cake defective. Norway: Imports of soya-bean meal and cotton-seed meal. Russia: Beans and products unsatisfactory as feeding stuffs. Spain: Soya bean unknown in Valencia district [They are neither cultivated nor imported in this district]. Straits Settlements [Singapore and Malaya]. Sweden: Soya-bean products introduced through England. Comparative value of cattle feed [work by Nils Hansson of Sweden], comparative prices of feed stuffs. Turkey. England: Liverpool (Conversion of the soya bean into cake and meal), Plymouth (Soya cake and meal extensively consumed), Southampton (The bean appreciated as a fattener and as a dairy ration, the soya bean as human food [for use in diabetic diets]). Ireland: Chinese bean products are favorably received, soya bean introduced in Belfast, small imports at Cork. Scotland: Statistics as to use in Dunfermline not available, test of feeding value of soya cake [by Prof. Douglas A. Gilchrist], Edinburgh mills making experiments (based on 1909 report 1909 of U.S. Consul Rufus Fleming from Edinburgh).

III. Competitive American exports. Tables (p. 35) show exports for 1907, 1908, and 1909 of cotton-seed meal, cotton-seed oil, and cottolene, lardine [not defined: presumably shortening made from cottonseed oil], etc. to major countries, especially in Europe.

The Introduction notes: “In compliance with requests from manufacturers of cotton-seed products in the United States, who desired that an investigation be made of the production and use of the soya bean and its manufacturers in the Far East and of the extent to which they compete with American cotton-seed products in the European markets, the reports following have been submitted by consular officers in

the various countries concerned...

“The reports of the consular officers have been placed in two groups, the first having to do with the countries that produce the soya bean and the second with the countries that are sought as markets. Statistics as to the imports of soya-bean products in many European countries were not available at the time the reports were submitted, but inasmuch as the prices quoted were generally lower than for other seed products, emphasis has been laid on the relative merits of the two classes of goods as shown by experiments and analyses in these countries. These manufacturers will have to work in meeting this new competition.”

Note 1. This is the earliest document seen (Dec. 2007) concerning soybean products (oil or meal) in Turkey, Denmark, Ireland, the Middle East, or Sweden (one of two documents); soybeans as such have not yet been reported in any of these countries. This document contains the earliest date seen for soybean products in the Middle East or Turkey (1909).

Note 2. This is the earliest English-language document seen (Oct. 2001) that uses the term “soya-bean flour.” Address: Chief of Dep.

83. Carson, John M. 1909. Soya bean and products: Japan (Document part). *Special Consular Report (U.S. Bureau of Manufactures, Department of Commerce and Labor)* No. 41. Part 5. p. 13-16. Erroneously numbered Special Consular Reports, Vol. XL.

• **Summary:** Vice-Consul-General E.G. Babbitt of Yokohama writes: “The soya bean, or soja bean, as it is known here (Common Japanese name ‘daidzu’ [daizu]), is cultivated throughout the Empire of Japan. The total area of cultivation is in the neighborhood of 1,200,000 acres, or about 3.8 per cent of the total area devoted to the cultivation of rice and other cereals and grains. The soya bean is often cultivated, not in fields by itself, but in rows along the edges of rice or wheat fields. These edges are, as a rule, very soft, for they have been previously plowed, and little labor is required in planting... In harvesting the plants are uprooted, and, after being dried in the sun for several days, flails are used to separate the beans from the pods. The flails are of a very primitive type, with bamboo handle and of light weight. Female and child labor is invariably employed in flailing.

“The kinds of fertilizers used differ by districts. In the prefecture of Miyagi, for example, straw ashes and superphosphate of lime are commonly employed, while in the prefecture of Akita wood ashes, superphosphate of lime, and horse dung are used.”

The average yield of soybeans in Japan over the past 10 years is 15.30 bushels per acre. For the year 1907 the highest yield is from Ishikawa prefecture, 21.62 bushels/acre, whereas the lowest yield is from Okinawa prefecture (Loochoo Islands, south of Kiushu [Kyushu]), 8.48 bushels/acre. During 1908 huge amounts of soya beans (3.3 million

piculs; 1 picul = 132.277 pounds weight) were imported to Japan from China, Kwantung, and Korea, with small amounts coming from Asiatic Russia. Large amounts of soya-bean cake (7.760 million piculs) were imported from China and Kwantung, with small amounts coming from Asiatic Russia and none from Korea. “The total imports of bean oil in 1908 amounted to only 49,993 pounds, valued at \$1,325.”

“The soya bean is one of the most important articles of food in Japan. The beans are cooked in various ways, while in brewing soy (shoyu), in the manufacture of miso (pea or bean cheese), tofu (bean curd), koya-tofu (frozen bean curd), and natto (steamed beans) they are the chief ingredient. They are also manufactured into flour and make up the principal part of many Japanese sweetmeats. All these foodstuffs are daily used in Japanese homes.

“To a limited extent soya beans are used as horse or cattle food, being sometimes boiled and mixed with straw, barley, bran, etc.”

The vice consul of Kobe states that in 1908 Japan produced 18,812,228 bushels of soya beans. Small amounts are exported “to Hawaii, the United States and Canada for use by the Japanese resident in those countries as an article of food.” Three factories in the Kobe district make bean cake, largely from imported, lower-cost soya beans. “The beans are first crushed flat, then put into a big container and steamed, after which they are put into a steam press to extract the oil and to be made into cakes. The cakes come in circular pieces, a yard in diameter and an inch thick, each weighing about 50 pounds. The oil is used for lubricating machinery. The cake is used only as a fertilizer and is not fed to animals as it causes their hair to fall off.”

Note 1. This is the earliest document seen (Feb. 2004) stating that soya bean oil can be used as a lubricant.

Note 2. This is the earliest English-language document seen (Feb. 2004) that uses the term “koya-tofu” (or “koya-dofu” or “kôya-dôfu”) to refer to dried-frozen tofu.

Note 3. This is the earliest document seen (Aug. 2011) in *Chemist and Druggist* in which the toxicity of a soy product is discussed or alleged, namely soya cake “is not fed to animals as it causes their hair to fall off.” Address: Chief of Dep.

84. Kita, Gen-itsu. 1909. Shôyu jôzô ni kansuru kenkyû. I and II. [Studies on shoyu brewing. I and II.]. *Kogyo Kagaku Zasshi (J. of the Society of Chemical Industry, Japan)* 12:1-24; 12:399-428. II. Application of natto microorganisms. [Jap]

• **Summary:** Part I is titled “Shoyu moromi and shoyu presscake” Address: Kôgaku-shi, Japan.

85. Lloyd, Arthur. 1909. Every-day Japan. London, New York, Toronto and Melbourne: Cassell and Co., Ltd. xvi + 381 p. See p. 121, 124, 188. Introduction by Count Hayashi.

Illust. Index. 24 cm. With 8 color plates and 96 reproductions from photographs.

• **Summary:** On the title page: “Written after twenty-five years’ residence and work in Japan.”

Chapter 22, “Life in a tea, silk, saké or shoyu district,” states (p. 121): “As a striking contrast to the general poverty of appearance of districts purely agricultural—i.e. devoted to the cultivation of rice and other cereals—we have the general aspect of those districts in which tea is the principal product, where silkworms are cultivated, or saké and soy manufactured. In these districts—known as “Shoyu” districts—there is a far larger amount of wealth, and the general standard of comfort in all classes is much higher.”

Continuing on p. 124: “Saké and soy [sauce] (the latter the foundation of our Worcestershire sauce) are old-established industries which have generally been carried on by the same families for generations.” Soy is mentioned briefly on p. 128.

Chapter 35, “Sights and cries in Tokyo streets,” states (p. 188-89): The first sounds he hears in the morning are those from a Buddhist temple. “Domestic life begins at a somewhat later hour, but in the streets I can already hear the cry of “Natto, na-tto-!” which tells me that the poor are beginning to bestir themselves. Natto is a concoction of beans which have been kept until they are beginning to go bad. It is said to have a rich tasty flavour, and to be very popular with some sections of the community. It is essentially a poor man’s dish. By the time the natto sellers have done their business, other itinerant vendors have begun their rounds.” Address: M.A., Lecturer in the Imperial Univ., Higher Naval College and Higher Commercial School, Tokyo. Formerly Fellow of Peterhouse [UK].

86. Brenier, H. 1910. La question du soja [The soya question]. *Bulletin Economique de l’Indochine (Hanoi)* 13(83):105-28. March/April. Series 2. [22 ref. Fre]

• **Summary:** This is an in-depth look at the relevance of the soybean to France, both now and in the future. It is prompted by the rapid growth of soybean imports to Europe from Manchuria. The author has a good knowledge of the literature on soybeans and a familiarity with the crop in the field in French Indochina and China.

Contents: 1. Soybean cultivation: Species and varieties, major soybean producing countries (China, Japan, Korea, Indochina), other countries (Java and the Dutch East Indies, France, USA. The Imperial Institute of London is conducting trials in the Cape of Good Hope and Natal [South Africa], in British West Africa, and in Gambia), methods of cultivation and yield. 2. Commerce: Exports of soybeans and soybean cake (beancake, *tourteaux de soja*) from China and especially Manchuria (Newchwang, Dairen/Dalny, Antung, Ta tung kow, Suifenhô [Suifenhe] / Sui-fen-ho), importing countries in 1908 in descending order of amount imported (Russian ports on the Pacific [Vladivostok, for

re-export to Europe], Great Britain, France, Holland, Italy, Belgium, Germany), prices. 3. Soybean utilization: Chemical composition, use as a forage plant and for improving the soil, use in human foods (tofu, shoyu, Worcestershire sauce, tuong [Annamite soy sauce], miso, natto, soymilk), the soybean as an oilseed (yield of oil from various oilseeds), soybean cakes. Conclusions.

Page 109 discusses soybeans in Indochina, according to information received from M. Crevost, Curator of the Agricultural and Commercial Museum of Hanoi, and from the article by Bui-quang-Chiêu (Dec. 1905). The names of the soybean are different in the various parts of Indochina. In Cochinchina (especially in the provinces of Chaudoc and Baria), in Annam (sporadically), and in Tonkin it is called *dau-nanh* or *dau-tuong* (*Tuong* is a sauce made with soybeans, described later under “Uses”). In Cambodia (*Cambodge*) it is called *sandek sieng*. The variety most widely cultivated in Indochina seems to be one with a yellowish-white color, more oblong than round, a little flattened (*soja platycarpa* of Harz [1880, 1885] (?)), different therefore from the fine (*belle*) varieties of Manchuria and Japan that are well rounded and pure yellow.

A table (p. 112) shows soy bean grain exports (in 1,000 metric tons) from different Manchurian ports for the years 1905-1908. The author notes that Indochina could be exporting soybeans to France. One factor that stimulated the large exports of soybeans from Manchuria in 1908 (besides an excellent harvest in 1907) was a program to suppress the cultivation of opium by expansion of soybean acreage (p. 113). The author uses the scientific *Phaseolus radiatus* to refer to the *petit haricot vert* (probably mung bean). He observed soybeans planted in mixed culture in Szechuan.

Page 116 notes that the rise of soy in Manchuria is due in part to the power of the Japanese commercial house Mitsui Bussan Kaisha and the large English oil mills, which joined to develop an industry that had not previously existed. At the end of 1906, Mitsui, which had a dominant commercial role in Southern Manchuria, sent one or two trial shipments of soybeans to England. Mitsui was followed mainly by the British trading houses (Samuel & Samuel, Jardine, Matheson), then by the Germans (Otto Reimers, Arnhold Karberg), and the Russians. Continued suppression of opium growing led to further expansion of soybean cultivation.

A table (p. 117) gives the price of soybeans (per picul of 300 catties = 180 kg), soybean cake (per 10 cakes of 53 catties each or 318 kg for the 10), and soybean oil (per picul of 100 catties = 60 kg) in Newchwang [Newchwang] taels and in French francs in the average year from 1882-1891, and in the year 1897. Prices were up in 1897.

Page 124 states: “A factory was recently founded near Paris (at Saint Germain en Laye), with Chinese capital, for the preparation of a series of products derived from soya: milk, “*caséo-sojaïne*,” cheese [tofu], sauce, and sweet soya preserves (*confiture* (?) *de soja*.” A footnote states: “I owe

this curious piece of information to the amicability of the secretary of *Ecole française d’Extrême-Orient*, Mr. Ch. Maybon, who pointed it out in the January 1910 issue of the *Bulletin de l’Association amicale franco-chinoise*.

A table (p. 125) shows that the soybean gives the lowest yield of oil of all major oilseeds: copra (from coconut) yields 67-70% oil, sesame seeds 50-56%, poppy seed (*pavot*) 43-50%, castor oil plant 42-50%, rapeseed (colza) 42-45%, linseed 43%, peanuts 35-47%, cottonseed 21-26%, soybeans from Manchuria 16-18%.

Note: This is the earliest document seen (March 2000) that describes *caséo-sojaïne* as a product. Yet this may well be a mistake since its source of information is given as *Bulletin de l’Association Amicale Franco-Chinoise* (Jan. 1910)—which uses the term to refer to a business name. Address: Inspecteur-Conseil des Services Agricoles et Commerciaux de l’Indochine.

87. Langworthy, C.F. 1910. Apendice. La soya como alimento para el hombre [Appendix: The soy bean as human food]. *Boletín de la Sociedad Agrícola Mexicana* 34(20):389-92. May 25. [1 ref. Spa]

• **Summary:** This is a Spanish-language translation of USDA Farmers’ Bulletin No. 58 (1897, Revised 1899). The soybean is referred to throughout as “La haba soya.” It describes and gives the nutritional composition of various Japanese soyfoods, including natto, miso (3 types; *miso blanco*, *colorado*, *Suiza* [Swiss]), tofu (*Tofu o queso de haba*; *Tofu fresco*), soymilk (*leche de la haba soya*), frozen tofu (*Tofu helado*), yuba, shoyu (*salsa de la haba soya*).

Note 1. This is the earliest Spanish-language document seen (Oct. 2008) that mentions yuba, which it calls *yuba*.

Under the name of coffee beans (*habas de café*), soybeans (*las habas soya*) are sometimes consumed in Switzerland as legumes (*como legumbres*); when they are dry and toasted, they are used as a substitute for coffee (*sustituir al café*). No mention is made of soybeans or soyfoods in Mexico.

Note 2. This is the earliest Spanish-language document seen (July 2000) that mentions tofu, which it calls *Tofu or queso de haba*.

Note 3. This is the earliest Spanish-language document seen (Jan. 2012) that mentions natto, which it calls *natto*.

Note 4. This is the earliest Spanish-language document seen (March 2009) that mentions miso, which it calls *miso*.

Note 5. This is the earliest Spanish-language document seen (Feb. 2004) that mentions soy as a substitute for coffee, which it calls *sustituir al café*.

Note 6. This is the earliest Spanish-language document seen (Oct. 2003) that uses the term *leche de la haba soya* to refer to soymilk.

Note 7. This is the earliest Spanish-language document seen (Feb. 2004) that mentions frozen tofu, which it calls “Tofu helado.” Address: PhD, Office of Experiment Stations,

USDA, USA.

88. *Nature (La) (Paris)*. 1910. Fromages végétaux [Vegetable cheeses]. 38(2, Supplement):134. Sept. 24. [Fre]

• **Summary:** A vegetable cheese is prepared from potatoes by the peasants of Saxony and of Thuringia [both in eastern Germany; Sachsen and Thuringen in German]. The “natto” of the Japanese (*Le “natto” des Japonais*) is made from soybeans. This type of beans (*haricots*) is boiled for about 5 hours then placed in little packets of straw. The packets are placed in a cave, in the middle of which a fire is lighted. The cave is closed and after 24 hours the little cheeses are ready to eat. Since the soybean contains a rather large quantity of legumin, or vegetable casein, natto is rich in nitrogen, the same as real cheese (it contains 7.3 to 7.5% nitrogen).

“The truth requires us to close by adding that we have tried to make these cheeses [natto] without complete success. The natto is easy to prepare, contains the usual quantity of nitrogen, and has a suitable consistency. But it may be because we used seeds imported from Korea, that is to say rather old ones, that it has a very strong flavor, like (by the way) the soybean itself, that a European palate would not be able to tolerate.” Address: France.

89. Friedenwald, Julius; Ruhrah, John. 1910. The use of the soy bean as a food in diabetes. *American J. of the Medical Sciences* 140:793-803. Dec. [9 ref. Eng]

• **Summary:** The article begins: “The soy bean (*Glycine hispida*), sometimes incorrectly called the soja bean, is an annual leguminous plant...” It continues with a brief but accurate history of the soy bean in Europe and the USA, a botanical description of the plant, examples of food uses such as boiled whole dry soybeans, green vegetable soybeans (“The beans are eaten as a vegetable, in soups, sometimes picked green, boiled and served cold with a sprinkling of soy sauce and sometimes served as a salad... If the beans are green, the preliminary soaking may be omitted.”), soy sauce or shoyu, natto, tofu, miso, yuba, a coffee substitute, and whole dry soybeans. A brief description of the process for making tofu is given, together with nutritional analyses of tofu, and 4 varieties of soybeans. “The most striking point about the bean is that it contains no starch, or, at least a very small quantity, which is strange when one considers it resembles the various beans very closely and all other varieties of beans are extremely rich in starchy materials.” An analysis of the “gruel flour from the soy bean” made by the Cereo Co., Tappan, New York, shows it to contain 14.64% protein, 19.43% fat, no starch, and no reducing sugars. “Our own experience with the soy bean in diabetes extends over a series of eight cases.” The 8 cases are then described individually. Cooking directions and recipes are given for making gruels, broths, and muffins using “soy gruel flour” or “soy flour.”

The authors conclude: “(1) The soy bean is a valuable

addition to the dietary of the diabetic on account of its palatability, and the numerous ways in which it can be prepared. (2) The soy bean in some way causes a reduction in the percentage and total quantity of sugar passed in diabetic subjects on the usual dietary restrictions.” Address: 1. M.D., Prof. of Diseases of the Stomach, College of Physicians and Surgeons, Baltimore, Maryland; 2. M.D., Prof. of Diseases of Children and Therapeutics same college.

90. Lafar, Franz. 1910. Technical mycology: The utilization of micro-organisms in the arts and manufactures. Vol. I. Schizomycetic fermentation. Translated from the German by Charles T.C. Salter. London: Charles Griffin & Co. xvi + 312 p. Introduction by Dr. Emil Chr. Hansen (Principal of the Carlsberg Laboratory, Copenhagen). Illust. (90 figs). Index is in Vol. II. 23 cm. [Eng]

• **Summary:** This first volume discusses bacterial (“schizomycetic”) fermentations. Richly illustrated, it also includes accurate historical background on many subjects. An extensive bibliography for both this volume and volume II appears at the back of volume II (p. 417-518).

The Preface, by Emil Chr. Hansen of Copenhagen, states (p. vi): “Within the last two decades the study of Microbiology has made gigantic strides, both in the pathological and technical branches of the subject; and just as investigations into the Physiology of the higher plants gave the first impetus to the establishment of Agricultural Experiment Stations in all countries, so, in like manner, have the Physiology of Fermentation and Technical Bacteriology called into existence, within the last few years, a number of Stations and Laboratories for the development of those branches of industry where micro-organisms play an important part.” The first three chapters, comprising the introduction, give an interesting early history of the discovery of fermentation. Their contents: 1. The theory of spontaneous generation: Definition, discovery of fermentative organisms, Needham’s demonstration in favour of ‘Generatio Æquivoca’, Spallanzani’s experiments, Franz Schultze’s experiment, foundation of the science of antiseptics by Schwann, labours of Schröder and Dusch, Pasteur’s examination of the theory, Béchamp’s microzyme theory, spontaneous generation only unproven, not impossible. 2. Theories of fermentation: The alchemists–Stahl’s theory of fermentation, Gay-Lussac’s opinion, Cagniard-Latour’s vitalistic theory, Th. Schwann’s researches, Fr. Kützing’s general theory, Liebig’s decomposition theory, Pasteur’s theory. Nägeli’s physico-molecular theory, the enzymes and M. Traube’s ferment theory, general definition of fermentation, so-called spontaneous fermentation of sweet fruits, decompositions effected by light and air.

In Chapter 31, titled “The fermentation of cheese and allied decompositions” (p. 243-52) are sections on “Pure culture ferments” (p. 246-47) and “Natto and miso” (p. 247-

48; each a kind of “vegetable cheese”). The latter section also discusses the Soja bean, Fr. Haberlandt, koji, shoyu (called shojou, soy or shoyu), tofu and nukamiso. Reports by H.C. Prinsen-Geerligs “on the preparation (by the aid of fungoid ferments) of other dishes from soja beans in Chinese cookery, such as Taohu or bean-cheese [tofu], the sauce Tao-yu, &c.”

In Chapter 33, titled “The fixation of free nitrogen by bacteria” (p. 259-71) are sections on “The discovery of leguminous nodules” (p. 261-62; Malpighi, Boussingault, Hellriegel), “Formation and functions of the nodules” (p. 262-64; Lachmann, Frank, Woronin, Hellriegel, Wilfarth), “The nodule bacteria” (p. 264-66; organized albuminoids, *Bacillus radicicola*), and “The bacteroids” (p. 266-69). Concerning bacteroids: “The first successful, artificial production of nodules by the aid of pure cultures was made by A. Prazmowski. This worker, in view of the absence of the sporogenic faculty in these organisms, changed the name of *Bacillus radicicola*, bestowed on them by Beyerinck, into *Bacterium radicicola*.”

Note 3. This is the earliest English-language document seen (March 2003) that uses the word “bacteroids” (or “bacteroid”) in connection with root nodules on plants.

Note 4. This is the earliest English-language document seen (Feb. 2004) that uses the word “Taohu” to refer to Chinese-style tofu. Address: Prof. of Fermentation-Physiology and Bacteriology, Imperial Technical High School, Vienna.

91. Sawyer, E.R. 1910. Studies in agriculture. Series 2. The soya bean. Div. of Agriculture and Forestry, Natal, South Africa. 33 p. Reprinted from the Natal Mercury. [10 ref]  
 • **Summary:** Contents: 1. The agricultural romance. 2. The commercial aspect. 3. The adaptability of the bean. 4. The cultivation of the crop. 5. Soya bean oil. 6. A food for man. 7. A stock food and fertiliser (the cake is widely used as an agricultural fertiliser in the Far East). A photo (opposite contents page) shows two men standing in a crop of soy beans at the Central Experiment Farm, Cedara, 1908-09.

Concerning “Soya bean oil”: “In the Far East it is largely employed for edible purposes; it is suitable for cooking, for a salad oil, and as a component in such butter substitutes as margarine. In the ‘Mark Lane Gazette’ for Jan. 20, 1910, it is stated that one third of the frying oil used in London kitchens now comes from the soya bean, instead of from cotton seed as heretofore” (p. 21).

Illustrations on unnumbered pages show: (1) A typical soya bean plant. (2) Botanical characters of soya bean, with close-ups of vegetative parts, floral parts, and fruit. (3) Seeds and pods of 7 varieties of soya beans. (4) Soya bean seedlings, with roots. (5) Roots of soya bean plant, with nodules (by Blanchard). (6) Curing frame for harvesting soya beans. Address: Director, Div. of Agriculture, Natal, Durban, South Africa.

92. Bontoux, Emile. 1911. Le Soja et ses dérivés [The soybean and its products]. *Matieres Grasses (Les) (Paris)* 4(36):2195-99. April 25; 4(37):2239-43. May 25; 4(39):2326-29. July 25; 4(40):2364-66. Aug. 25; 4(41):2405-07. Sept. 25. [48 ref. Fre]

• **Summary:** Contents. Introduction. The plant: origin and history, species and varieties, culture, and production: USA, Japan, Manchuria, France, England, China, Korea, Indochina (it is cultivated for the needs of the population in Cochinchina {especially in the provinces of Chaudoc and Baria}, Annam, Tonkin, Cambodia), Formosa, Java, India, Africa. The soybean—a food plant: The plant, the seed, large table showing many analyses from many countries of the chemical composition of many soybean seed varieties.

Introduction to food products made from soybeans in East Asia. Shoyu [soy sauce] (and koji). Miso. Natto (from Japan). Le Tao-yu (a Chinese condiment also widely used in Japan. It is a thick, clear liquid made from black-seeded soybeans) Tao-tjiung (doujiang, from China). Tuong (from Annam). Tofu. Li Yu-ying. Table showing composition of powdered soymilk, fresh tofu, and soy flour.

The soybean—an oilseed plant. The soybean as an oilseed in the Far East. Table showing exports of soybean cake and oil from various Manchurian and Chinese ports in 1908 and 1909. The soybean as an oilseed in Europe and the United States. Table showing imports of soybeans to various British ports in 1909 and 1910 (the leading port by far is Hull, followed in 1909 by Liverpool, London, Bristol Channel, Scotland, and Other ports {Rochester, etc.}). Table showing exports of soy oil from Great Britain in 1910: To Germany, Austria, Australia, USA, Belgium, Denmark, Egypt, France, Holland, Italy, the Indies (*Indes*), Norway, Russia, Sweden, other, total (115,372 barrels, each weighing 175 kg). Discussion of soy oil and cake in most of the above countries.

Trade in soybean seeds: Mitsui Bussan, Manchuria, England, China, Japan. Soybean cake.

Soy oil: Physical and chemical properties. Applications and uses as food and in industry: Margarine, for illumination, soaps, as a drying oil, paints and varnishes, linoleum, artificial rubber. An extensive bibliography is at the end of the last article in the series.

Note: This is the earliest document seen (May 2010) concerning the cultivation of soybeans in Cambodia. This document contains the earliest date seen for the cultivation of soybeans in Cambodia (April 1911). Earlier documents imply that soybeans were being cultivated in Cambodia by 1900, and it is highly likely that they were being cultivated for at least a century before that time. Address: Ingénieur-chimiste E.C.I.L., France.

93. *Christian Science Monitor*: 1911. Plant cheese. July 15. p. 9.

• **Summary:** From the *Los Angeles Times*: “Plant cheese, made from the Soja bean, is a favorite food of the Japanese. The beans are boiled for several hours, pressed into a thick mass, shaped into cakes and then wrapped in straw and piled up in a cellar; a fire is made in the cellar, which is then closed and the cakes are left exposed to it 24 hours. Although containing no milk whatever, this cheese is like the milk cheese in taste, owing to a vegetable casein it contains in large quantity, but the odor is much more penetrant than that of ordinary cheese. This food goes under the name of natto in Japan.”

94. Abel, Mary Hinman. 1911. Beans, peas, and other legumes as food. *Farmers' Bulletin (USDA)* No. 121. 38 p. See p. 11-13, 17-20, 35-36. Revised Nov. 15, 1906. Reprint, Sept. 30, 1911. [1 ref]

• **Summary:** This is a reprint of the 1906 revised edition. The information about soy is unchanged. On pages 17-18 is a section titled “The peanut” (*Arachis hypogaea*). On pages 35-36 is a section titled “Peanuts and peanut preparations” which includes a subsection titled “Peanut butter.—The roasted peanut ground to an oily meal has somewhat the consistency of butter and is now marketed under the name of peanut butter. Salt is perhaps quite generally added during the process of manufacture. Water is also sometimes added—usually before serving. Peanut butter is used like other butter to spread on bread, for the making of sandwiches, and in the preparation of a number of made dishes. Many persons like its flavor when it is fresh and of good quality, and it seems fair to say that the use of this and other sorts of nut butter is growing. As regards composition, peanut butter, which is essentially the ground roasted peanut, contains more protein and less fat than ordinary butter. Little is known regarding the digestibility of peanut butter, but the fine grinding would naturally seem to be of an advantage. Judged by Jaffa’s experiments with a ration containing peanuts, it would be well digested. (See p. 26)

“Peanut oil.—At present the American peanut crop is not large enough to more than supply the roaster and the confectioner, hence the expressing of oil from the peanut has never become established here, but in Europe large quantities of the African-raised nuts are used for this purpose. The shelled nuts contain from 30 to 50 per cent. of oil. The oil is said to be of fairly good flavor, but inferior to olive oil. In 1899 some 80,000 tons of the nuts were used in Marseille alone for oil making. The unhusked nuts are passed between a pair of rapidly revolving grooved rollers and the shells and red inner skins are then removed by a winnowing process with the use of air currents and oscillating sieves. The cleaned kernels are ground and enveloped in fibrous mats and pressed to extract the oil.

“According to Brannt, “the first cold pressure yields 16 to 18 per cent of very fine table oil. The residue is then broken up, moistened with water, and again cold pressed,

yielding 7 to 8 per cent of more or less valuable oil, used for table purposes and burning. The residue from this is heated and then pressed, giving 7 to 8 per cent more oil, unfit for table use, but used for soap and lubricating.” The grades of oil are sold as salad oil alone or mixed with olive oil.

“Peanut cake.—When the oil has been pressed from the ground nut, the mass remaining, called oil cake, is used for fattening. Some experiments have also been made as to its food value for human beings. Containing, as it does, 47 per cent of protein and 9 per cent of fat and starch, and costing about 5 cents a pound, this attracted the attention of German scientists. The oil cake broken up and cooked a long time in water and eaten as a soup or porridge in a hospital. Most of those who tried it ate it with apparent relish, not once only, but again and again. No effort have been made to ascertain to what extent it was digested, and the use of the cake does not seem to have passed the experimental stage.”

95. Barrett, O.W. 1911. Rice ally crops. *Philippine Agricultural Review* 4(11):592-98. Nov. See p. 594-96. [1 ref]

• **Summary:** The section titled “Soybeans” (p. 594-96) begins: “Probably every tourist who has visited any of the cities of Japan or China has noticed in the markets these peculiar blocks of a grayish white, jelly-like substance and wondered whether they were really good to eat, but comparatively few have ever tried there the three or four varieties of vegetable ‘cheese’ prepared from the soybean\*.”

\*Footnote: A 3/4 page footnote, extracted from USDA Farmers’ Bulletin No. 58 by Langworthy, discusses five preparations commonly made in Japan from the soybean: natto, tofu or bean cheese (eaten in the fresh state or frozen), miso, yuba, and shoyu.

“Experts in threpsology, the new science of nutrition, seem to be in accord on the fact that in dietary matters two kinds of food are at least four times as good as one... Recently the European food experts have realized the high nutritious value of the soybean and a factory has been established near Paris [by Li Yu-ying] for the manufacture of various food products from this wonderful seed.”

“Now is the time for the Philippine Agriculturist to take up soybean culture in earnest, and to develop it in the same way, even if not to the same degree, as our neighbors across the way have been doing for centuries. The fact that there are practically no seeds of this valuable crop at the present in the Philippines is a sad commentary on the progressiveness of the Philippine farmer; but it is never too late to learn” (p. 596). Address: Chief of the Div. of Experiment Stations, Philippines.

96. Jingu Shicho. 1911. Koji ruien [Encyclopedia of early references to things Japanese]. Tokyo: Koten Kokyusho. Revised editions publ. in 1931 and 1971 by Yoshiko Bunkan; 51 volumes. Key volumes are Inshoku (#39) and Shokubutsu

(#50). [50+ ref. Jap]

• **Summary:** Koji means “ancient things” or “origins.” Rui means “varieties” or “description.” En means “dictionary.” This is one of the best books for doing historical research on Japanese culture, including foods. The book is divided into 30 major subject areas, such as Food and Drink. Within that section all basic Japanese foods and beverages are listed. After each one is listed many of the important early works in which that food is mentioned, with a quote of what is said. Furigana are used liberally to assist with pronunciations of hard-to-pronounce early document names and terms. Compiled from 1896 to 1914, volume 1 of the original edition is dated 1908. The works cited are from ancient times to 1867. The final volume is an index to the whole.

The volume on Food and Drink is titled *Inshoku-bu* (Vol. 51). Whole soybeans, p. 229-35. Black soybeans, p. 235-36. Green soybeans (*ao-daizu*), p. 236-37. Green vegetable soybeans (*edamame*), p. 239-40. Soybean cultivation, p. 240-42. Soybean utilization, p. 243-47. Daizu-ko Mochi, p. 555. Amazake, p. 695-97. Shirozake, p. 697-98. Hishio (Chiang), p. 836-40. Shoyu, p. 840-49. Miso, p. 851-68. Kuki (fermented black soybeans), p. 868-71. Natto, p. 871-74. Tofu (incl. Dengaku), p. 984-1005. Yuba, p. 995-96.

97. Sawyer, E.R. 1911. Cedara memoirs on South African Agriculture. Vol. II. Containing reports on feeding crops and livestock experiments in South Africa. Natal/Pietermaritzburg, South Africa. 371 p. See p. 131, 177, 183-218. Report X. The Legumes as Grain and Oil Crops: Soya Beans. [15 ref]

• **Summary:** A superb, early overview of soybeans and their uses in South Africa and England. Contents: An agricultural romance. Early experiments with the soya bean [in Europe and South Africa]. Export trade from Manchuria. The course of prices. Consumption in Great Britain. Botanical character. The commercial aspect. History of the oil market during 1910. The adaptability of the bean. Germination of seed. Climatic requirements. Classification of varieties. Variety tests at Cedara: Black seeded (Buckshot and Nuttall tested in 1906), brown seeded, green seeded (Samarow and Guelph), yellow seeded (Mammoth and Hollybrook, planted Nov. 1908). The cultivation of the crop. Times of planting. Distances of planting. Manure experiments at Cedara. Nodule formation and composition of the plant. Harvesting soya beans. Storage of seed. Comparative yields of grain. Soya bean oil. Uses of the oil [for cooking, paint, soap, etc.]. Soya beans as human food (incl. natto, tofu, miso, yuba, shoyu {p. 209-11}). Digestion experiments [on humans in Japan]. Milling experiments. Soya beans as stock food and fertiliser. Live-stock experiments. Soya cake as fertiliser. Soya bean as green forage.

Concerning industrial utilization: The Vice-Consul-General at Yokohama writes that “the annual value of fertilisers employed in this country (Japan) amounts on an

average to about £8,000,000 represented in equal proportions by artificial fertilisers and soya bean cake.” The year 1908 was exceptional, however, in that the value of the bean cake was 3.5 times that of the artificial fertilizers.

During 1910 the linseed oil reached its highest price in 50 years. Soya oil, now produced in large amounts in Manchuria after the Russo-Japanese war took its place. It was used in making paints, candles, and soaps. “Soya bean oil has been found eminently suitable for the soap-makers’ purpose on account of its low content of free fatty acids and of unsaponifiable matter or impurities. In the latter respect it has been shown superior to any of the other oils or fats of commerce, whether of vegetable or animal origin. The glycerine, which is secured as a by-product of soap and candle manufacture, is subsequently distilled for explosives, such as dynamite, blasting gelatine, cordite, etc., and for various purposes in the arts, for filling gas-metres, for the manufacture of inks, printers’ rollers, etc. The residue from the distillation of glycerine is used in the manufacture of boot blacking.”

Concerning germination (p. 191): At Cedara: “The first crop was planted in 1903, and a maximum yield of 920 lb. of grain obtained per acre. In the following season, characterized by unfavourable weather conditions, the heaviest yield on a new series of plots was 780 lb. per acre. A third season’s trial on the same ground, however, witnessed a marked increase with local seed, the heaviest crop totalling 1,252 lb. of grain.”

Concerning soybean cultivation in British colonies in Africa (p. 192): “Early last summer the late Sir Alfred Jones shipped to West Africa soya beans for experimental purposes, and it was subsequently reported by Mr. A.G. Turner, who was entrusted with a special mission to encourage this culture on the west coast, that the soya bean could be successfully cultivated throughout the Gambia, Sierra Leone, Nigeria, and the Gold Coast Colony, but that the yield to the first experiment had only been from six to eight bushels per acre, there having been a considerable loss owing to faulty germination. Later results, however, were phenomenally successful.”

Concerning soybean trials in South Africa (p. 192-93): “During the past year favourable results have been received from Umzinto [from Messrs. Archibald and Co., 52 miles south of Durban; elevation 300 feet], Nel’s Rust Estate [64 miles north of Durban; elevation 2,710 feet], Nottingham Road [elevation 4,807 feet], and Naval Hill [Mr. J.R.T. Clouston of Garrow planted a few acres in 1908], Colenso [elevation 3,200 feet], and Cedara [82 miles by rail from Durban; elevation 3,540 feet; a number of varieties were tested in 1906] in Natal; and from Barberton and Pretoria in the Transvaal.”

Concerning comparative yields (p. 203): “As a grain producer, the soya bean compares very favourably with other leguminous crops, such as field beans, peas, etc. At Cedara



no other legume has produced, with chemical manures only, so heavy a yield of seed; and no other legume, except the lupine, has showed itself so much to be depended upon as a grain producer.” “Land that will produce 10 muids of maize per acre should yield at least six muids of beans after the second year’s cultivation,…”

Concerning human digestion experiments (p. 212): “The general opinion of Japanese investigators, and others familiar with Oriental dietetics, is that the protein in articles of food prepared from soya beans is in a very available form, and that these preparations are most valuable foods.”

Five photos show various men standing in a crop of soya beans and in some of the variety plots at Cedara (1909-11). An illustration (line drawing) shows a curing frame for soya beans.

Tables show: (1) Yields in lb. per acre of soya beans sown at different times, during 3 years (19-3-04 to 1905-06). For each year is given: Date of sowing, date of harvest, yield of grain and straw, and manures used (superphosphate, gypsum, and potash). The variety tested was Henderson’s Early Green (Guelph) (p. 198). (2) Results of manure experiments with soya bean (Early Green) in lb. per acre. Sown 4 Nov. 1904. Harvested 13 March 1905. Increasing yields “may be attributed to the association of nitro-bacteria, the benefits of constant cultivation, and the accumulation of humus and residues of fertilizers” (p. 200). (3) Feeding value of soya bean cakes for manure, based on experiments by Messrs. Lever Bros., Port Sunlight, Liverpool (p. 215).

Note 1. This is the earliest document seen (June 2004) that mentions the use of a soy oil derivative (glycerine) in printing inks.

Note 2. This is the earliest document seen (May 2004) that mentions the use of soy oil to make candles (one of two documents).

Note 3. This is the earliest document seen (June 2004) concerning the use of soy oil (or the glycerine derived from it) to make explosives.

Note 4. The next section of this report (p. 218+) is about ground nuts (*Arachis hypogoea*). Address: Director, Div. of Agriculture and Forestry, Natal; Principal, Cedara School of Agriculture; Formerly Asst. Secretary of Agriculture, Southern Rhodesia.

98. Ward, Artemas. 1911. The grocer’s encyclopedia—Encyclopedia of foods and beverages. New York, NY: Published by the author. 748 p. Illust. (color). 29 cm.

• **Summary:** Soy-related entries: Bean (p. 49-54): “The bean of European history is the Broad or Windsor variety,…” “The principal beans of United States cultivation are the Kidney and Lima, both of them believed to be native to South America.

“The Kidney Bean is the Haricot of the French and in Great Britain is sometimes called the French bean.” The many varieties can be classified into “tough podded” and

edible podded.” “The ‘tough podded’ class produces the bulk of the dried beans of commerce, variously known as ‘Kidney Beans,’ ‘Navy Beans,’ ‘Marrow Beans,’ ‘Black Beans,’ ‘Turtle Beans,’ etc., in many colors, shapes and sizes.” “‘Flageolets’ are cultivated with special regard to the consumption of the fresh seeds or beans.” To the “edible podded” class of kidney beans belong Wax or Butter Beans, the Cranberry Bean or Red Speckled Bean, String Beans, Snap Beans, French Beans. “Pea Beans are the Cowpeas of the agriculturist.” “Among numerous other ‘special’ varieties are the Soy Bean (which see), Asparagus Bean, Frijole, Lab-lab (or Egyptian Kidney), Red Bean, and Scarlet Runner.” Asparagus Beans are known as *Tou Kok* by Chinese gardeners in California.

“Catsup, Catchup, Ketchup: a word derived from the name of an East Indian pickle, which was formerly applied specifically to the boiled spiced juice from salted mushrooms, but is now freely attached to various sauces (sold both bottled and in bulk) which consists of the pulp—bottled, strained and seasoned—of various fruits, as tomatoes, green walnuts, etc.” Note: At “Catchup” and “Ketchup” we are told to see “Catsup.”

Locksoy ([Lock Soy], p. 346): “Rice boiled into a paste and drawn into threads, imported from China. It is used to thicken soups.”

Nuts (p. 412-13): A table shows the nutritional composition of all major American nuts, including almonds, chincapin [chinquapin] or water chestnut, chufa (earth almond), cocoanut, peanut, and peanut butter. “Many special nut foods, such as malted nuts, meat substitutes, etc., have been devised and extensively advertised by manufacturers for general dietetic use and for the special needs of vegetarians and fruitarians. It is said that some of these products contain soy beans, but apparently the peanut is very important in their composition.

Sauces (p. 552-53): In bottled sauces, vinegar is the most common liquid ingredient. “Commercial sauces of the Worcestershire kind, if of good quality, generally have Soy (which see) as their chief character ingredient. A typical formula of Worcestershire-style includes, in addition to Vinegar and Soy, a considerable percentage of lime juice, onions and tamarinds and small quantities of garlic, fish (as anchovies or pickled herrings), red chilies and spices. The product, after cooking, is strained through fine hair sieves. Leicester Sauce resembles Worcestershire in general characteristics but is less pungent.”

Soy (p. 576): “A brown sauce, valuable to the commercial sauce market, made from the Soy Bean, a native of Southeastern Asia [sic] and widely grown in China and Japan. The beans are boiled, mixed with ground wheat or other grain, salt, etc., and allowed to ferment for a month or 6 months. The liquid is then strained off and clarified. Molasses is frequently added. In appearance it resembles Worcestershire Sauce, of which it is an important ingredient.

It should not be too salt [salty] or too sweet, and although thick and syrupy, should be clear. When shaken in a bottle or glass it should, if it is genuine, leave a bright yellow film on the glass. Being a very desirable article, it is often counterfeited.”

Soy bean (p. 577): “Commercial and government circles, both in Europe and this country are devoting increased attention to the cultivation of the Soy Bean as a food product, as it contains a large percentage of protein and a fair amount of fat, thus resembling meat in general nutritive value. The cell-walls of the raw bean are very tough, but thorough cooking makes it readily digestible. Boiled with bacon and other fatty broths until soft and then seasoned, the result is a vegetable dish very pleasing to the average palate. If the beans are dry, a preliminary soaking to remove the skins is necessary.

“The Soy Bean is largely consumed in Japan, China and other parts of Asia as an adjunct to rice and other foods, taking the place of meat in the popular dietary. It is most popular in these countries in fermented form, the best known types being *Shoyu* or Soy Sauce; *Tofu*, a kind of cheese; *Miso*, Soy Bean ‘Milk’ [sic]; *Yuba*, the evaporated product of ‘Miso’ [sic], and *Matto* [sic, *Natto*], a product obtained by simple fermentation of the boiled beans. The various degrees and styles of fermentation serve the double purpose of rendering the beans more easily digestible and producing new flavors, just as by the fermentation of milk and cream we produce the different flavors of cheese.

“The plant is an annual, growing chiefly in bush form...” The different varieties are classified principally by the color of the beans: “Black, Yellow, White and Brown,... Types of all these four classes are grown to some extent in Germany, Austria, and Switzerland, and the first three also in this country, in North Carolina and other Southern States. Under favorable conditions a single plant may bear a hundred or more pods.

“Because of the fact that the beans contain little if any starch, they have been recommended as a desirable food for diabetics, and Soy Bean Bread and Soy Bean Meal are prepared for that purpose in Paris. The dried beans are also used in Switzerland and elsewhere as a coffee substitute.” An illustration shows the top of a soy bean plant, with leaves, pods, and flowers.

Note 1. This book is full of fascinating information about the food system in the USA in 1911, with entries such as cold storage (first attempted in 1860, it has grown to extraordinary proportions), coloring matter (great improvements, no longer harmful), ice and refrigeration (ice manufacture dates from about 1870; today nearly 200 companies produce ice for general sale, mostly using the compressor and anhydrous ammonia). Dictionary of food names in five languages (English, French, German, Italian, and Swedish, p. 710-724) and a dictionary in English of “Culinary and bill-of-fare terms” (p. 741-45).

Note 2. The author, Artemas Ward, lived 1848-1925. His father was Henry Dana Ward (1797-1884), his grandfather was Thomas Walter Ward (1758-1835), and his great-grandfather was Artemas Ward (1727-1800), the first Commander-in-Chief of the colonial troops before the arrival of George Washington (a little-known Virginia planter) on 3 July 1775. Thereafter he served as second in command after Gen. Washington and was a Major General in the American Revolutionary War. Address: Formerly (from 1874) founder and editor of *The National Grocer*, 30 Union Square, New York.

99. Li, Yu-ying; Grandvoinnet, L. 1912. Le soja [The soybean]. *Agriculture Pratique des Pays Chauds (Bulletin du Jardin Colonial)* 12(107):120-32. Feb. [12 ref. Fre]

• **Summary:** Contents (continued): 2. Soy flour and its derivatives: Soy flour (preparation, chemical composition), soy bread (*pain de soja*), wholemeal bread (*pain complet*), other products based on soy flour (as biscuits and cakes for diabetic diets). 3. Soy oil and by-products of the oil mill: Soy oil (physical and chemical properties, usage, price), residue of the oil mill: the cake (price, uses). 4. Use of the soybean as a legume: Whole soybeans (composition, digestibility), soy sprouts (*germes de soja*), green vegetable soybeans (*le soja frais*). 5. Fermented soy condiments—Solid condiments from Japan: Tokyo natto (*Le Tokio-Natto*, whole fermented soybeans, without salt) and Ping-Ming natto. (*Le Ping-ming-Natto*; fermented black soybeans with salt, ginger, orange rind, etc. A similar product is made in China and called *tao-tche*).

Note 1. This is the earliest French-language document seen (Feb. 2004) that uses the term *Tokio-Natto* to refer to natto.

Note 2. Footnote 2 under Soy bread (p. 122) states: “M. Dujardin-Beaumetz, *L’Alimentation et les Régimes*,” Soy bread constitutes a major step forward in the feeding of diabetics; it has a long shelf life and a relatively agreeable flavor.

Note 3. The book referred to here is probably: Dujardin-Beaumetz, Georges Octave. 1889. “L’hygiène alimentaire: Aliments, alimentation, régime alimentaire dans les maladies. Deuxième édition revue, corrigée et augmentée” [Food hygiene: Foods, feeding, special diets for illnesses. 2nd ed., revised, corrected, and expanded]. Paris: Octave Doin. viii + 239 p. Series: Conférences de Thérapeutique de l’Hopital Cochin, 1885-1886. Illust. Address: 1. Conseiller de 1ere classe au Ministère de l’Agriculture de la Chine; 2. Ingénieur agricole (G.).

100. Sawamura, Shin. 1912. Nattô-kin ni tsukite [On the “Bacillus natto”]. *Nogaku Kaiho (J. of the Scientific Agricultural Society, Japan)* No. 120. p. 1-5. Aug. 5. [Jap] Address: Nôgaku hakase, Japan.

101. *New York Times*. 1912. Gives out secrets of making ammonia. Sept. 12. p. 6.

• **Summary:** An overview of the Eighth International Congress of Applied Chemistry, held in New York City at the Horace Mann Auditorium.

The section titled "Natto, a cheese" states: "S. Muramatsu of the College of Agriculture, Morioka, Japan, read an interesting paper on natto. Natto is a vegetable cheese much used in Japan. It is made by fermenting boiled soya beans wrapped in rice straw and set in a warm cellar for one or two days. It is consumed as 'an accessory,' (by which Dr. Muramatsu apparently means a relish or condiment,) after having been mixed with table salt and several stimulants 'amongst others the powdered mustard is preferred.'

"It is, according to the Doctor, a very good and economical foodstuff, rich in protein, and particularly valuable to the Japanese because of their large dependance on rice, which is almost entirely carbohydrate."

102. Li, Yu-ying; Grandvoinnet, L. 1912. *Le soja: Sa culture. Ses usages alimentaires, thérapeutiques, agricoles et industriels* [The soybean: Its culture. Its food, therapeutic, agricultural, and industrial uses]. Paris: Augustin Challamel (Rue Jacob 17). 150 p. Illust. Index. 25 cm. Translated into French and expanded from the Chinese edition, published by la Société Biologique d'Extrême-Orient (1910). [151 fr.]

• **Summary:** One of the earliest, most important, influential, creative, interesting, and carefully researched books ever written about soybeans and soyfoods. Its bibliography on soy was larger than any published prior to that time. It was first published as a series of eight articles in *Agriculture Pratique des Pays Chauds (Bulletin du Jardin Colonial)* from September 1911 to April 1912. Before being published as a book, it was revised slightly by adding a table of contents at the back, dividing the material into 5 parts with 19 chapters, and adding several photos (p. 16-17), a world map showing the distribution of soybean cultivation (p. 21), and an interesting 2-page table (p. 66-67).

Contents: The soybean: Origin and history. Part I: Soybean culture. 1. Species and varieties of soybeans: Botanical characteristics, species, varieties (Chinese, Japanese, Indian, Indochinese, Hawaiian, USA, European). 2. Needs of the soybean: Climatic, geographical area of the soybean by region worldwide, agrological/soil needs, fertilizers, soil preparation, the place of the soybean in crop rotations. 3. Soybean seeds: Study of seeds (by weight, by germination rate, selection of seeds), time of planting, plant spacing, depth of seeding, rate of seeding per hectare, method of seeding (broadcasting, in rows, in mounds). 4. The soybean during its vegetative stage: Germination, transplanting, types of care (e.g., second dressings), irrigation, flowering and fruiting, enemies of the soybean

(e.g., insects). 5. Harvest of soybeans: Time for harvest (forage or grain), methods of harvesting (forage or grain; mechanical mower), threshing (use of machine), yields of soybeans (forage and grain in various countries, ratio of seeds harvested to straw is about 1 to 2, yield of nutrients). 6. Fixation of atmospheric nitrogen by soybeans, and improvement of the soil. 7. The soybean in mixed cultures and alternate rows: With corn, cowpeas, rice, sweet sorghum, or millet.

Part II: Chemical composition of the soybean. 1. Composition of the plant: Minerals in the leaves and total plant. 2. Study of the seed: Composition, chemical composition, microscopic comparisons, table of analyses by 28 previous researchers, albumins, sugars, starch, dextrin or dextrine, diastase, lipids, ash/minerals.

Part III: The soybean as human food and animal feed. 1. The soybean as feed for animals: Green forage and hay. 2. The soybean in human feeding: From the viewpoints of physiology, economy, and gastronomy. The role of soya in special diets: Vegetarianism, remineralization, diabetic, and lactose intolerant.

Part IV: Food products based on soya. 1. Soymilk and its derivatives: Soymilk (Methods of manufacture, Chinese and modern at l'Usine de la Caséo-Sojaïne, nature and properties [physical and chemical] and composition of the milk, action of ferments and diastases (enzymes) on the milk, uses of the milk, the residue from the soy dairy [okara], condensed soymilk, powdered soymilk, fermented soymilk (kefir, yogurt, etc.)), tofu (called Caséo-Sojaïne, or fromage de soya; methods of production, coagulants, yield of tofu, storing tofu, composition and comparison with various meats, digestibility, culinary preparations made from tofu (smoked tofu, tofu pâté, tofu sausages)), Soy casein (food and industrial uses). 2. Soy flour and its derivatives: Soy flour, soy bread, wholemeal bread, other products based on soy flour (as biscuits and cakes for diabetic diets). 3. Soy oil and its by-products: Soy oil, physical and chemical properties, usage, residue of the oil mill: the cake, price, uses. 4. Use of the soybean as a legume: Whole soybeans (composition and digestibility), soy sprouts (*germes de soja*), green vegetable soybeans (*le soja frais*). 5. Fermented soy condiments: Solid condiments from Japan: Tokyo natto (*Le Tokio-Natto*) and Ping-Ming natto or tao-tche (*Le Ping-ming-Natto*; fermented black soybeans with salt, ginger, orange rind, etc. A similar product is made in China and called tao-tche). Paste condiments: Miso (four types and composition), tao-tjung (Chinese miso). Sauces: Shoyu (its production, varieties, properties, composition), chiang-yu (*tsiang-yeou*), ketjap [kechap, from Java], tuong (from Annam, with rice or corn), tao-yu (widely used in China and Japan, described by Prinsen Geerlig). 6. Confectionery products: Comparison with chestnuts, roasted soy flour to replace chocolate. 7. Soy coffee (with analysis by Kornauth). 8. Special fermented products: Kiu-tsee (a special commercial ferment from

Canton described by Thiersant), fermented soymilks.

Part V: Industrial uses of soybeans. Oil based: soap, wax candles (*bougie*), and paint oils. Protein based: sojalithe or soy stone which corresponds to lactite, insulators for electrical apparatus, glue, etc. Conclusion. Addendum (*Complément*) to Part III, Chapter 1: Soybean straw and stems. Composition of various seeds, including soybeans. Soy flour. The cakes from oil mills. Soymilk and the cake from soy dairies (*tourteau de laiterie*, okara).

A very interesting table (p. 66-67, which does not appear in the original 8 articles) shows earlier nutritional analyses of the composition of soybeans by Steuf (from Hungary, Mongolia and China), Schroeder, Caplan, Pellet (from China, Hungary, Etampes), Muntz, Nikitin (black soybeans from Russia, 2 samples), Lipski [Lipskii] (yellow, from Russia), Giljaranski (yellow from Russia, China and Japan; black from China and Japan; green), König (*Hispida platycarpa* black, Tumida yellow, brown and black), Prinsen (white from Java and China), Goessmann, Kellner, USDA, Chemiker Zeitung (white from Java and China, 29 Jan. 1896), Scuff (misomame; miso soybeans), Zulkovski (yellow from China, reddish brown from Mongolia), Institut Agr. de Vienne (Austria; yellow from Vienna, reddish brown from Tirol), Ecole Imp. et Roy d'Ag. Hong (yellow from Mongolia and China, reddish brown from China), Chez M. Olivier Lecq (from Moravia), Lechartier (Etampes and black), Joulie (yellow), Stingl and Morawski, Bloch (yellow, green, and black), Balland, Cavendish Evelyn Liardet (yellow, brown, green, black, and white), Jardin Colonial (Laos, Tonkin, China), Aufray (Tonkin, Yun-nan), Homes Laboratory (black from China, or white). Photos and illustrations are the same as those referenced in individual sections of the book, except for the following: A field of soybeans (p. 16). A soybean plant growing in Europe (p. 17). Color illustrations appear facing pages 12, 22, and 64. Address: Li is from Societe Biologique d'Extreme-Orient (Chine). Grandvoinet is from Ingenieur Agricole (G.).

103. Muramatsu, S. 1912. Preparation of "natto." *Eighth International Congress of Applied Chemistry, Original Communications* 18:251-63. Section VIIIb: Pharmaceutical Chemistry. Held 4-13 Sept. 1912 in Washington and New York, USA.

• **Summary:** Contents: Introduction. Soya beans. Rice straw. Cellar. The preparation of natto. The microbes of natto: Bacillus no. 1, bacillus no. 2, bacillus no. 3. The application of cultured bacteria for the preparation of natto. Natto as a food accessory.

Natto is "a kind of vegetable cheese made by fermenting boiled soy beans wrapped in rice straw and set in a warm cellar one or two days. Thus the product becomes white and mucilageous [mucilaginous] by the development of bacteria. Natto is consumed as an accessory after having been mixed with table salt and several stimulants, amongst others the

powdered mustard is preferred. It is chiefly consumed in Tokyo and the north-eastern districts of Japan and for the production of it Aizu is the noted place. It is chiefly consumed in Tokyo in the summer time, but in the north-east during the winter time, as these are rather poor in vegetables at that season." The author prepared natto with the different types of soya beans grown in Japan "and could not find a more suitable kind than the small yellowish white bean."

The straw serves to flavor the product as well as to permit ventilation and so keep down the content of free ammonia. The various organisms found in the samples examined were isolated and described. "I express many thanks to Dr. Satô, Director of our College." Address: College of Agriculture, Morioka, Japan.

104. Sawamura, S. 1912. On *Bacillus natto*. *Eighth International Congress of Applied Chemistry, Original Communications* 14:145-47. Section VIb: Fermentation. Held 4-13 Sept. 1912 in Washington and New York, USA. [1 ref. Eng]

• **Summary:** Natto is prepared by wrapping boiled "soya-beans" in rice straw then leaving them in a warm place overnight to ferment. The author formerly isolated two species of bacteria from natto obtained in Tokyo. Over the years, he has examined bacteriologically many natto samples obtained from various places and found that all contain "Bacillus natto," which produces natto of good flavor and strong viscosity. He then gives a detailed bacteriological description of this bacillus, including: Form, mobility, spore-formation, Gram's method decolorization, oxygen needs, scum in bouillon, scum in pepton water, agar plate culture, gelatine plate culture, agar streak culture, gelatine streak culture, agar stab culture, gelatine stab culture, soya bean agar, potato, gas, azolithmin-milk, indol, hydrogen sulfide gas formation, etc. Address: College of Agriculture, Imperial Univ., Tokyo [Japan].

105. Muramatsu, S. 1912. On the preparation of natto. *J. of the College of Agriculture, Tokyo Imperial University* 5(1):81-94. Oct. Journal name also written as Tokyo Noka Kiyô. Also published in 8th International Congress of Applied Chemistry, Orig. Comm. 18:(251-63). [Eng]

• **Summary:** Contents: Introduction. Soya beans. Rice straw. Cellar. Preparation of natto. The microbes of natto; Bacillus no. 1, 2, and 3. The application of cultured bacteria for the preparation of natto. Natto as a by-food (incl. table of nutritional composition of fresh and fermented natto).

"There are several kinds of *natto* prepared in Japan, but here I mean common natto, which is a kind of vegetable cheese made by fermenting boiled soya beans wrapped in rice straw and set in a warm cellar for one or two days. Thus the product becomes white and mucilageous [sic, mucilaginous] by the development of bacteria. Natto is consumed as a by-food after having been mixed with

table salt and several stimulants, of which amongst others powdered mustard is preferred. It is chiefly consumed in Tokyo and the north-east districts of Japan, and for the production of it Aizu [in Fukushima prefecture] is the noted place. It is consumed in Tokyo in the summer time, but in the north-east districts during the winter time, as these are rather poor in vegetables at that season.”

In Section “V. The microbes of natto,” after summarizing the published findings of Dr. Yabe and Dr. Sawamura, Muramatsu continues:

“Mr. Nonzen isolated several kinds of bacteria, among them on bacillus to which Dr. Omori gave the name of *Bacillus viscosus natto* and which, he said, is the principal microbe that produces strong viscosity. The two kinds of bacilli, which he named *Bacillus odorans natto 1*, and *Bacillus odorans natto 2*, produce good aroma in natto; and another one which he named *Pseudomonas odorans natto*, produces also good aroma. The latter three did not produce good natto, unless the material is inoculated also with *B. viscosus natto*. Thus the author [Monzen] concluded that there are necessary for the preparation of natto at least two kinds of bacteria, one producing the peculiar aroma and the other strong viscosity.

“Mr. Muto [1905] isolated several bacteria and concludes that only one bacillus belonging to the *B. subtilis* group is necessary for the production of natto.

Muramatsu investigated several kinds of natto prepared in Tokyo, Aizu, and Morioka. He found that they all contained the same microorganisms, among which three bacilli (which he described) were the principal ones. He learned that the three bacilli were similar to those isolated previously by Sawamura, Muto and others. He also agreed with Muto that only one bacillus was necessary for natto fermentation, and that any one of the three would do the job. He agreed with Sawamura that the organism similar to *B. natto* Sawamura did not yield enough viscosity, however Muramatsu discovered that whenever the fermentation was carried out at high temperature (45°C), the Bacillus No. 1 “produces the best quality of natto, providing much mucilage [high viscosity] and good aroma. For each of the three bacilli about 18 characteristics are examined and described.

For example: Bacillus No. 1. “Enzyme: Diastase and proteolytic enzyme of tryptic nature are recognized.” Note: All three bacilli produce diastase (which hydrolyzes starches to make sugars) plus trypsin-like proteolytic enzymes. This bacillus [Muramatsu’s No. 1] may be the same as those which Dr. Sawamura represented as Bacillus No. 2 and *Bacillus viscosus Omori*, and also that which Mr. Muto thought was the only bacterium which produces natto, though there are several differences in its behaviour investigated by these author.”

“Bacillus No. 2. This bacillus develops more energetically at high temperature and produces natto of the best quality, forming much mucilage and a rather higher

aroma than Bacillus No. 1.”

“Bacillus No. 3. This bacillus develops most energetically at 40°C, and when it is developed on boiled soya beans at this temperature it produces good natto with strong viscosity and good aroma; but its mucilage is somewhat less than Bacillus No. 1 and Bacillus No. 2.”

Note 1. This is the second report (after Sawamura) of separating *Bacillus natto* from natto.

Note 2. This is the earliest document seen (Jan. 1912) that mentions the word “enzyme” (or “enzymes”) in connection with natto, or that describes the specific types of enzymes produced by the natto bacteria. Address: College of Agriculture and Dendrology, Morioka, Japan.

106. Sawamura, Shin. 1912. Ueber den Bacillus Natto [Concerning the Bacillus Natto]. *Chemiker-Zeitung* 36(134):1306. Nov. 7. [Ger]

• **Summary:** Contains a brief description of how natto is made and details of its chemical composition after 14 hours and 7 days. Address: Tokyo.

107. Sawamura, Shin. 1913. On bacillus natto. *J. of the College of Agriculture, Tokyo Imperial University* 5(2):189-91. March. [1 ref. Eng]

• **Summary:** “Natto is an article of food prepared by leaving boiled soy-beans wrapped in rice straw in a warm place for a night, and thus making them ferment. Soy-beans of natto are coated with a characteristic slimy substance. The author separated formerly two species of bacilli from natto obtained in Tokyo, No. 1 of which produced good flavored natto when inoculated to boiled soy-beans, and No. II strongly slimy one. The former bacillus was considered to be the chief actor in natto fermentation and received the name of ‘*Bacillus natto*.’ In later years the author examined bacteriologically many samples of natto obtained at various localities, and found that the producer of natto is the same in all cases, viz. ‘*Bacillus natto*.’ This bacillus can produce natto of good flavor and strong viscosity, and the presence of other microbes is not necessary in the fermentation of natto.” A detailed bacteriological description of *Bacillus natto* is then given. “It was confirmed by the previous investigation that *Bacillus natto* produces a trypsin-like enzyme, and decomposes protein of soy-beans... *Bacillus natto* produces diastase, but reducing sugar was not found in natto thus prepared.”

When *B. natto* acts on boiled soy beans at 35°C for 14 hours and for 7 days, the following results are obtained, respectively: Total nitrogen, 7.36, 7.42; insoluble albuminoid nitrogen, 5.89, 2.10; soluble albuminoid nitrogen, 1.48, 5.31; soluble coagulable nitrogen, 0.31, 0.18; soluble non-coagulable nitrogen, 0.32, 0.48; nitrogen, of peptone and polypeptides, 0.21, 0.41; nitrogen, of arginine, histidine and lysine, 0.07, 0.09; nitrogen of purine bases, 0.09, 0.14; nitrogen precipitated by phosphotungstic acid, 0.11, 2.11;

soluble organic matter, 21.95, 41.55. Carbohydrates of soy beans are mainly galactans, not much starch being present.

Note: This is one of the key early research articles in understanding *Bacillus natto*, the natto bacterium.

Note 2. This is the earliest English-language document seen (July 1998) that mentions polypeptides in connection with soybeans. Address: Japan.

108. Friedenwald, Julius; Ruhrah, John. 1913. Diet in health and disease. 4th ed. Thoroughly revised and enlarged. Philadelphia, Pennsylvania: W.B. Saunders Co. 857 p. Illust. 24 cm. [4 soy ref]

• **Summary:** The section titled “The soy bean” (p. 124-26) states: “This bean (*glycine hispida*), sometimes called the soja bean, is an annual leguminous plant extensively used as a food in China and Japan. Until recently it has been regarded as a botanical curiosity in the Occident. It has recently been extensively used in America as a forage crop and to improve the soil if plowed under... There are a large number of different varieties, which vary in size, shape, color, and length of time they take to mature. Some are grown exclusively for the oil they contain, and it is used for culinary, illuminating, and lubricating purposes. The light-colored beans are eaten in soups, and the pods are sometimes pickled green, boiled, and served cold with a sprinkling of soy sauce. The green varieties are often pickled in brine and eaten moist or dried with meals as appetizers; the same varieties are often sprouted, scalded, and served with meals in winter as a green vegetable. The bean forms the basis of the so-called soy sauces, used as a condiment all over the world. The Oriental races most frequently eat the bean, in more or less cheesy-like foods, which are prepared from it. The most common of these are natto, tofu, miso, yuba, and shoyu. Natto is a sort of bean cheese made by boiling the beans until they become soft and then placing the resulting mass in a warm cellar where it ferments. Tofu is made by soaking the beans in water, crushing between millstones, and boiling in about three times their bulk of water. The protein is precipitated and the resulting cheese eaten. The white milky liquid of the above has nearly the composition of cows’ milk, and tastes something like malt. It may be used in infant feeding to advantage (see same).

“Americans may eat the beans in numerous ways described under the head of soy bean cookery in the recipes at the end of this book. The bean is of particular value in diabetic diets (see same). It may be used to increase the protein of the diet.

There are variations in the composition of the different varieties.” A table shows the chemical composition of yellow soy beans grown in the USA, both as is and calculated on a water-free basis. “The Cereo Company of Tappan, New York, have made a soy bean flour which is useful.” Its composition is given. “The percentage of protein in this flour is almost one-third greater than the percentage of protein

in the whole beans. This is caused by removing the coarse fibrous hulls which contain little protein.

“Vegetable food of such composition certainly is remarkable when compared with round beef, medium”—whose composition is given.

Soy flour can be used as a gruel, in broths, and in making biscuits. A table (p. 126) shows the “Composition of fresh and dried legumes (incl. soy beans, cow peas, chick-peas, peanuts) with that of other foods” (Based on Abel, Farmers’ Bulletin No. 121 [1900, p. 17]).

The section on “vegetarianism” (p. 130-31) is the same as that in the 1909 edition (p. 113-14).

In the chapter on “Infant feeding,” the section on “Other food for infants” has a subsection on “The soy bean” (p. 297-98) which begins: “In certain conditions the soy bean... is of great value. In cases when milk is badly borne, in certain forms of intestinal disorders, in diarrhea, and especially in the convalescence after diarrhea, in certain cases of marasmus and in malnutrition, the soy bean flour, properly used, is of great value. Each ounce contains 13 grams protein and 120 calories.” A table shows the composition when mixed with various amounts of water. Recipes for making gruels are given.

In the chapter on “Diet in disease,” in the section titled “Diseases in which diet is a primary factor,” is a subsection on “The soy bean” (p. 592) states: “The bean contains about 8 per cent. of sugar and no starch, and furnishes a large amount of available protein and fat.” “A patient on a strict diabetic diet, who is excreting a certain amount of sugar, will excrete less sugar when the soy bean is added to the diet. It seems to be of particular value in severe cases. In addition to this action, it is a very valuable food, both on account of its nutritious properties and owing to the fact that it may be prepared in a number of different ways, and so serves to vary the diet.”

In the section on “Diabetic Foods” (p. 601-02) is based on Winton (1906) and contains the same information, including that about The Health Food Company of New York.

In the chapter on “Recipes” is a section on “Bread” (p. 740-41) which includes whole-wheat bread, zwieback, and bran muffins for constipation. The same chapter has a section on “Soy bean cookery” (p. 766-69) with the following recipes: Introduction, gruels, broths, muffins, nut-cakes, soy bean cakes, breakfast food (like oatmeal), pancakes, soy bean cheese (“In Seattle, Washington, and other places in the West we are informed that tofu is made by the Japanese and sold to the Oriental residents”). Goff (1911) offers the following: Grilled soy bean [dry roasted soynuts], [whole] soy beans with butter, soy beans au gras (fried with onions and fat), bread or cakes of soy beans.

Note: Julius Friedenwald lived 1866-1941. John Ruhrah lived 1872-1925. Address: 1. Prof. of Gastro-Enterology; 2. Prof. of Diseases of Children. Both: College of Physicians

and Surgeons, Baltimore, Maryland.

109. Jumelle, Henri L. 1913. Les cultures coloniales: Légumes et fruits. Deuxième édition [Crops of the colonies: Vegetables and fruits. 2nd ed]. Paris: Librairie J.-B. Baillière et Fils. 122 p. See p. 47-51. Illust. No index. 18 cm. [Fre]  
 • **Summary:** This is the 2nd volume of an 8-volume work. In Chapter V, “Vegetables,” the section titled *Glycine hispida* Max. discusses soybeans and soyfoods.

Henri Jumelle lived 1866-1935. Address: Prof., Faculté des Sciences de Marseille [Marseilles], France.

110. *Pharmazeutische Zentralhalle fuer Deutschland*. 1913. 8. Internationaler Kongress fuer angewandte Chemie in New-York [8. International Congress for Applied Chemistry in New York (Abstract)]. 54:62-65. See p. 65. [Ger]  
 • **Summary:** On p. 65 is an article titled “Ueber die Darstellung von ‘Natto.’” This is a German-language summary of the following English-language article: Muramatsu, S. 1912. “Preparation of ‘natto.’” *Eighth International Congress of Applied Chemistry, Original Communications* 18:251-63. Section VIIIb: Pharmaceutical Chemistry.

111. Grimme, Clemens. 1914. Die Sojabohne und ihre Verarbeitung zu Nahrungs- und Genussmitteln [The soybean and its processing for food and stimulants]. *Konserven-Zeitung* 15(1):1-3, 10-11. Jan. 2. [1 ref. Ger]  
 • **Summary:** The author discusses the many food uses of soybeans and how they are made and used, drawing heavily on *Le Soja* by Li & Grandvoinet (1912). He notes that there is a steadily rising interest in soyfoods in almost all branches of the German food industry [perhaps in anticipation of World War I].

Foods made from natural [unfermented] soybeans include: Soymilk (*Sojamilch*), tofu (*Sojakäse*), frozen tofu (*Kori-Tofu*), soy flour (*Sojamehl*), soy bread (*Sojabrot*), soya confections (*Sojakonfekt*), soy chocolate (*Sojaschokolade*), soy coffee (*Sojakaffee*), and green vegetable soybeans (*Soja als Gemüse*). Foods and seasonings made from fermented soybeans include: (1) Solid seasonings: Natto (Japan; Tokio Natto, Ping-Ming Natto). Tao-tche (China [fermented black soybeans]). The process for making this Chinese food is exactly the same as that used to make natto in Japan [sic, almost completely different]; (2) Seasonings in paste form: Miso (4 types), and Tao-tjiung (Doujiang, Chinese miso); (3) Liquid seasonings: Shoyu (Schoyou), Tsiang-Yeou (Chinese soy sauce), Ketjap (Javanese soy sauce), Tuong (Annamite soy sauce, made with rice or corn), Tao-Yu (soy sauce made with black soybeans in China and Japan).

Note 1. This is the earliest German-language document seen (June 2009) that mentions green vegetable soybeans, which it calls *Soja als Gemüse*.

Note 2. This is the earliest German-language document

seen (Oct. 2003) that uses the term *Sojamilch* to refer to soymilk. As of Jan. 2009 *Sojamilch* is the modern German word for soymilk.

Note 3. This is the earliest German-language document seen (Jan. 2009) that uses the word *Sojaschokolade* to refer to soy chocolate. The German word for “chocolate” is *Schokolade*.

Note 3. This is the earliest German-language document seen (Dec. 2011) that mentions fermented black soybeans, which it calls *Tao-tche*. Address: Dr.

112. Eddington, Jane. 1914. Economical housekeeping: More about soy beans. *Chicago Daily Tribune*. Feb. 4. p. 16.

• **Summary:** Because of its high protein content, the [whole dry] soy bean must be soaked for a long time then cooked gently for “several hours to reduce it to the required softness.

“It does not make as smooth a purée as the pea or peanut—in fact a rather granular one is obtained—but that nevertheless is palatable when dried over a hot fire, with a seasoning or butter, pepper, and salt if needed.” We should manufacture “soy sauce from this bean—that sauce without which chop suey and many other Chinese dishes would not be what they are. In a government bulletin on the legumes we have a general description of how this is made.” There follows a summary, with long quoted excerpts, of the section titled “The soy bean and its preparations” in: Oshima, Kintaro. 1905. “A digest of Japanese investigations on the nutrition of man.” *USDA Office of Experiment Stations, Bulletin* No. 159. 224 p. See p. 23 on. Shoyu, tofu, miso and natto are discussed briefly.

113. Shibukawa, Kôzô; Nakanishi, Kinzaburô. 1914. Kyokushi seizô narabini seizôhô-chû ni okeru kagakuteki seibun no henka ni tsuite [On the chemical change during the manufacture of kyokushi]. *Minami Manshu Tetsudo K.K., Chuo Shikenjo Hokoku (South Manchuria Railway Co., Central Research Institute, Report)* No. 2. p. 25-53. [Jap]

114. Koenig, Franz Joseph. ed. 1914. *Chemie der menschlichen Nahrungs- und Genussmittel*. Vol 3. Untersuchung von Nahrungs-, Genussmitteln und Gebrauchsgegenstaenden. II. Teil. Die tierischen und pflanzlichen Nahrungsmittel... Ed. 4 [The chemistry of human foods and food adjuncts (stimulants / enjoyables). Vol. 3. Investigation of foods, food adjuncts (stimulants / enjoyables), and kitchen utensils. Part II. Animal and plant foods... 4th ed.]. Berlin: Verlag von Julius Springer. xxxv + 972 p. See p. 488-89, 610. Illust. Index. 25 cm. [Ger]  
 • **Summary:** The section on commercial sauces (p. 149) mentions Japanese and Chinese soy sauce (*Soya oder Shoja oder Soja or Shoyu*). The section on plant cheeses (*Pflanzenkäse*, p. 331) mentions those made from soybeans, including as natto, tofu (Japan), tao-hu (China). In Africa the seeds of *Parkia africana* are used to make products such

as “Daua-Daua” of “Afiti” whose composition is similar to those made from soybeans. A table gives the composition of Daua-Daua cheese (*Daua-Daua Käse*) and Parkia seeds as reported by H. Fincke (1907).

The section on legumes (p. 488-89) discusses soybeans, which are best known in the form of products such as “Indian soy sauce” (*India Soja*, p. 149) or Tofu (p. 331). Recently, defatted soybean press-cake has been introduced as a feed for cattle.

The section on “Microscopic investigations of flours and starches” (p. 609-10) gives details and five cross-sectional illustrations of soybean tissue and cells. The first two, based on A.L. Winton, show: (1) A general cross section (source: Winton 1906, p. 248). 2. Surface of the cotyledons (epidermis), with palisade cells and aleurone cells. The last three, based on A. Scholl, show: (1) A tangential section. (2). Palisade cells. 3. Parenchyma under *Traegerzellen*. Address: Geh. Reg.-Rat, o. Prof. an der Kgl. Westfaelischen Wilhelms Universitaet und Vorsteher der Landw. Versuchsstation Muenster in Westphalia, Germany.

115. Fruwirth, C. 1915. Die Sojabohne [Soybeans]. *Fuehlings Landwirtschaftliche Zeitung* 64(3/4):65-96. Feb. 1 and 15. [65 ref. Ger]

• **Summary:** Contents: Introduction (work in East Asia and Europe from 1905-10). History. Botanical aspects. Varieties. Breeding. Needs of the plant (incl. “heat units,” *Wärmesumme*). Utilization (incl. in German *Tofu*, *Miso*, *Chiang*, *Schoyu* or *Sojatunke* (shoyu, p. 83), *Natto*, *vegetabilische Milch* (soymilk), soy sprouts). Measures and precautions in cultivating soybeans (incl. yields). The soybean as a crop in central Europe. Conclusion.

Note: On p. 83 the term “Sojas” is used to refer to soybeans, and “Sojatunke” to refer to soy sauce.

In 1905 the Japanese made the first attempt to import soybeans from Manchuria to Europe, but it failed because they did not arrive in good condition. The repetition of the attempt in 1908, however, gave good results. Then imports of soybeans grew, followed by imports of soybean cake (*Sojabohnenkuchen*). Major importers today are England, France, Germany, Denmark, Italy, Belgium, Netherlands, Sweden. The high import duty hinders imports to Austria-Hungary.

Toward the end of the 1800s in Russia, Owinsky took early-ripening soybean varieties from China and Japan and requested the expansion of soybean cultivation. In 1899 in Kiev, Owinsky wrote the name of the soybean as *Soja hispida praecox* (p. 67). Owinsky in Derajne [Derazhne?] grew Podolie soybeans (p. 77). Sempolowsky in Derebzin, Russian Poland, also grew soybeans. European Russia gets soybeans overland (probably from Manchuria). Russia was one of the first countries to take an interest in growing soybeans after 1908. Russia now grows large amounts of soybeans in Podolia. In Germany, Prof. Kalló in Wiesbaden

was a pioneer who recommended soybeans as an inexpensive food for the people. North America first started to import lots of soybeans as a source of oil because of a bad cottonseed harvest.

“Since the start of my teaching activities, I have had an interest in the soybean plant and have carried on my own investigations.” In 1900 the author received 7 soybean varieties from L.V. Jurdiewicz from Deraznia in Podolia; these had been imported by Owinsky. In 1901 at Hohenheim he began to study the time needed for soybeans to mature; He found it ranged from 141 to 163 days. He continued this research at Hohenheim from 1901 to 1903, getting soybean seed yields of up to 1,560 kg/ha. From 1910 to 1914 he continued at Waldhof-Amstetten, with 5 varieties. The maturity range there was 112-166 days and the yields were up to 1,500 kg/ha (about 23 bushels/acre), but the yields of many varieties were low, about 300 to 500 kg/ha (4.5 to 7.5 bu/acre). Yields of soybean straw, however, were up to 3,600 kg/ha. Fruwirth uses three terms to refer to soybeans: (1) Die Sojabohne; (2) Die Soja; and (3) Sojas, as “Zuechtung von Sojas” or “Sojas, meist gemahlte.” There are now a proposal to establish a joint stock company for growing soybeans in central Europe (probably in Germany), using big money. But it may not succeed because soybean yields in Germany and Austria are low. Seedsmen who sell soybeans commercially in 1915 include: Haage and Schmidt (Erfurt, Germany), Vilmorin Andrieux (Paris, France), Dammann & Co. (St. Giovanni at Tedaccio, near Naples, Italy), and Wood and Son (Richmond, Virginia, USA). The main soybean varieties sold by each of these companies are described in detail (p. 73-74).

Utilization (p. 82): Since soybeans are rich in protein and fat, they can be used as a good meat substitute. In Europe the use of soybeans for food is still very small. “In Europe, the first foods from soybeans were made in France, at Vallées near Asnieres: Flour, bread, and cakes for diabetics, and cheese. In Germany not long ago the Soyama-Works at Frankfurt am Main likewise began the production of such foods. Similar foods were also made in Romania. Soybeans sprouted in the dark yield a bitter-tasting salad. Production of vegetable milk started in France at ‘Caséo Sojaïne’ at Vallées (Seine); and is now being studied by the Synthetic Milk Syndicate in England. Using the process developed by Fritz Goessel, this Syndicate made 100 liters of soymilk from 10 kg of ground soybeans at a factory at Liverpool.” “It is in no way certain that soybeans will ever be widely used in human foods.”

A fairly large amount of soybeans are ground for use as fodder. The main use is for oil extraction. Yet Haberlandt considered that since the soybean contained only about 18% fat (range: 13-22%), its use as a source of oil would not be economical. The main use of soy oil is in soaps, for which it is highly prized. It is also used in making paints as a partial substitute for linseed oil. The best quality may be used as food. In England soy oil is used for margarine production.



Conclusion: The soybean originated in central Asia and is now widely cultivated in China, Japan, Manchuria, and India. Its seeds are rich in protein and, unlike most other legumes, also rich in fat. The plant is used in its homeland mostly as a source of human foods and seasonings, made by fermentation; the oil is used mostly for industrial non-food purposes. In recent years soybean production has expanded significantly in the southern part of the United States. There it is used mainly as green fodder, hay, silage, and soil building. The main expansion of soybean cultivation in Europe has been in Italy, southern France, Hungary, and southern Russia. Good early varieties give yields of 1,100 to 1,300 kg/ha. A large expansion of soybean production in central Europe is possible only in southern Austria and Hungary, and maybe in a few other places where it is warm. But late-maturing soybeans may be grown for forage and silage in the cooler parts of Germany and Austria. Address: Prof., Dr., Wien (Vienna).

116. Schieber, W. 1915. Die Sojabohne und deren volkswirtschaftliche Bedeutung als Nahrungsmittel [The soybean and its economic significance as a food]. *Oesterreichische Chemiker-Zeitung (Vienna)* 18(10):85-86. May 15. Excerpts from a lecture to the Austrian Chemical Society, 24 April 1915. [1 ref. Ger]

• **Summary:** Includes a summary of information from Li Yu-ying (1912) about foods and food adjuncts made from the soybean: Soymilk, tofu (*Sojakäse*), soy flour (*Sojamehl*), soya bread (*Sojabrot*), soya confections (*Sojakonfekt*), soy chocolate (*Sojaschokolade*), soy coffee (*Sojaskaffee*).

Japanese foods from fermented soybeans: Natto (*Feste Würzen*), miso (*Pasten*), soy sauce (*Saucen*). Plus original nutritional analyses. Address: Austria.

117. Schieber, W. 1915. Die Sojabohne und deren volkswirtschaftliche Bedeutung als Nahrungsmittel [The soybean and its economic significance as a food]. *Seifensieder-Zeitung* 42(22):471-72. June 2. (Chem. Abst. 10:1558). [Ger]

• **Summary:** Descriptions and nutritional analyses are given of a number of different food products prepared from the unfermented and the fermented soy bean. Unfermented: soya milk, tofu (*Sojakäse*), soy flour ("because of its composition it can be recommended as a first class food for diabetics and vegetarians"), soya bread, soya confections (resembling marzipan), soya chocolate, soya coffee, soy grits, whole dry soybeans, and soy sprouts. Fermented: Solid seasonings such as Japanese natto, pastes such as Japanese miso, sauces (in Japan each year 10,000 factories make 700 million liters of soy sauce), a new German fermented soyfood product is made by a secret process; its contains 45% protein, 6% nutritional salts, and about 2% lecithin. Address: Dr.

118. Martindale, William Harrison; Westcott, W. Wynn.

1915. The extra pharmacopoeia of Martindale and Westcott. 16th ed. 2 vols. London: H.K. Lewis & Co., Ltd. See vol. I, p. 563, 849. Index. 17 cm. [14 ref]

• **Summary:** In Vol. I, the section titled "Oleum papaveris" (p. 562-63) is about "Suggested use of other oils to replace cod liver oil in malnutrition, phthisis and other forms of wasting disease." "Several nutritive oils... which rank almost as high as Cod Liver Oil in Iodine values, suggest themselves as suitable for therapeutic use. These oils are used both medicinally and as foods..." A table shows each oil with its iodine value. Cod liver oil 126-66. Poppy seed oil 138.1. Maize oil 111. Sunflower seed oil 136.1. Soya bean oil 122. Of these, poppy seed oil seems to be suited for use as an alternative to cod liver oil. Arachis oil, sesame oil, and henbane oil are also discussed briefly.

In the chapter titled "Supplementary list of drugs" is a long section (p. 805) on "Soya Bean.—*Glycine Hispida (Leguminosae)*. This bean is extensively cultivated in China and Japan for human consumption and laterally in America and Europe, chiefly as a forage crop, is eaten as a vegetable, in soups, sometimes picked green, boiled and served cold with a sprinkling of Soy Sauce, and sometimes as a salad. A favourite method of preparing in the East is to boil until soft and place the resulting mass in a warm cellar until it ferments,—the resulting 'cheese' being known as 'Natto.'

"Analysis of the bean calculated on water free basis, indicated 38.5% Protein and 20% fat. It is probably due to this large amount of easily assimilable Nitrogenous matter that the Chinese and other rice eating people require so little meat. It contains practically no Starch—the latter fact is said to be due to presence of a diastase in the bean capable of converting Starch formed, two-thirds into Sugar, one-third into Dextrin. Has been used as an addition to ordinary diabetic dietary,—the beans may easily replace the Gluten of bread,—causes reduction in percentage of sugar (*Lancet* 1910, p. 1844). Soy Flour is even more serviceable, containing almost 1/3 more Protein than the bean, this being due to the removal of the fibrous hulls, which contain but little Protein (*British Medical Journal Epitome* 1911, p. 80).

"The protein of the Bean is being extensively used in connection with the treatment of diabetes and malnutrition. Soya Bean Meal from which it is made must be carefully examined for the toxic *Java Bean*.—F.W. Crossley Holland (*Pharmaceutical Journal and Pharmacist* (London) 1912, p. 154). Soya Beans average 8 m.m. in length and 7 m.m. in breadth and 6 m.m. in thickness. They are roundly ovoid in shape and about 99% are pale yellow in colour—there being a few darker coloured, smaller and more elongated. Structure of the bean. Soya Bean Cake and Meal is enormously adulterated.—T.E. Wallis (*Chemist and Druggist* (London) 1913, p. 278; *Pharmaceutical Journal and Pharmacist* 1913, p. 120).

"E.S. Peck states *Glycine Hispida* has been used in clinical experiments for the splitting up of Urea into

Ammonium Carbonate.

“\* Sarton is a preparation of the bean for use as a diabetic food.

“Soya Oil has Iodine value 121 to 123. Cowie found 131 (Chemist and Druggist 1910, p. 66). For further characters see (*Pharmaceutical Journal and Pharmacist* (London) 1911, p. 407).” See also p. 563.

In Vol. II, the section titled “Lecithin” (p. 76) states that it is a “Mono-amino Phosphatide” and contains a table listing the percentage of lecithin contained in 17 substances, including: Brain 160. Spinal cord 11.0. Nerve tissue (dry) 17.0. Kidneys 8.5. Egg yolk 12.0. Lupin seeds 2.0. Yeast (dry) 2.0. The soybean is not mentioned. A test of purity of lecithin made from fresh egg yolk, and the determination of lecithin in preparations are described.

William Martindale lived 1840-1902. Volume I also discusses Gluten (p. 546—Synonym: Vegetable Albumin), Diabetic foods (p. 546-47, incl. starchless bread; soy is not mentioned), *Oleum sesami* Sesame Oil (p. 571; also called Benné oil, gingelli oil, teel oil), *Arachis Hypogaea* (p. 805; also called Pea Nut, Ground Nut, Goober Nut, Manilla grain [Manila grain], Chinese Almond).

Volume II also discusses “glutin” (p. 86-89), proprietary medicines (incl. Ovaltine, and Pinkham’s (Mrs. Lydia E.) Vegetable Compound, p. 162-63). Address: 1. Ph.D., F.C.S.; 2. M.B.Lond., D.P.H.

119. Piper, C.V.; Morse, W.J. 1916. The soy bean, with special reference to its utilization for oil, cake, and other products. *USDA Bulletin* No. 439. 20 p. Dec. 22. [9 ref] • **Summary:** Contents: Introduction. Soy beans in Manchuria. Soy beans in Japan. Soy beans in Europe. Soy beans in the United States. Methods of oil extraction. Soy-bean meal as human food. Soy-bean meal as stock feed. Soy-bean meal as fertilizer. Uses of soy-bean oil. Analysis of important varieties of soy beans. Possibility of developing a manufacturing industry with American-grown soy beans.

“Analyses of important varieties of soy beans (p. 16-17):... In determining the range in the oil and protein contents of over 500 varieties grown in the variety tests at Arlington Farm, Virginia, the percentage of oil was found to range from 11.8 to 22.5 [Tokyo had 20.7% and Biloxi had 20.3% oil] and of protein from 31 to 46.9 [Chiquita had 46.9% protein]... At the present time the Mammoth Yellow variety is the most generally grown throughout the South and is the one used in the production of oil. The yellow-seeded varieties, which are most suitable for the production of oil and meal, contain the highest percentage of oil.

“Environment has been found to be a potent factor in the percentage of oil in the same variety. Considerable differences occur in oil content when soybeans are grown in different localities. The Haberlandt variety grown in Mississippi, North Carolina, Missouri, Virginia, and Ohio gave the following percentages of oil, respectively: 25.4,

22.8, 19.8, 18.3, 17.5; while the Mammoth Yellow variety grown in Alabama, South Carolina, Tennessee, North Carolina, and Virginia gave, respectively, 21.2, 19.6, 19.5, 18.4, and 18.8. Variety tests conducted in various parts of the country indicate a higher percentage of oil with the same variety for southern-grown seed. Similar results have been obtained in Manchuria, the North Manchurian beans showing an oil content of 15 to 17 percent and the South Manchurian beans from 18 to 20 percent.”

Photos (both by Frank N. Meyer) show: (1) A fleet of junks carrying soy beans to Newchwang, Manchuria.

(2) Coolies at Newchwang, carrying loads of soy beans from junks to big stacks.

An outline map of the USA (p. 8) shows the area to which the soy bean is especially adapted for growing for oil production. The area of double hatching shows that it is especially well suited to the Deep South. The northern boundary of the area where it is “less certain of profitable production” includes the southern one-third of Ohio, Indiana, and Illinois, and most of Missouri. On the west, the “less certain” area includes the eastern one-third of Nebraska, Oklahoma, and Texas.

Tables show: 1. “Exports of soy beans, bean cake, and bean oil from the principal ports of South Manchuria (Antung, Dairen, Newchwang), 1909 to 1913, inclusive.” 2. “Quantity and value of exports of soy beans and soy-bean oil from Japan to foreign countries, 1913 and 1914.” The countries are: China, United Kingdom, France, Germany, Belgium, United States, Hawaii, British America, Australia, other countries. 3. “Quantity of imports of soy beans, soy-bean cake, and soy-bean oil from Dairen, Manchuria, into Japan, 1911 to 1914, inclusive. The greatest imports were of soy-bean cake, followed by soy beans, with only small amounts of oil.

(4) “Quantity and value of imports of soy beans, bean cake, and bean oil by European countries, 1912 to 1914, inclusive.” The countries are: Austria, Belgium, France, Germany, Italy, Netherlands, Russia, Sweden, United Kingdom. In 1912, the UK imported the most soy beans, while Netherlands imported the most cake and oil. (5) “Quantity and value of imports of soy beans, soy-bean cake (Footnote: Includes bean cake [perhaps fermented tofu or canned regular tofu], or bean stick [perhaps dried yuba sticks], miso, or similar products, with duty, 40 per cent) and soy-bean oil into the United States, 1910 to 1915, inclusive.” The quantity of soy bean imports was greatest in 1915 with 3.837 million lb. The quantity of soy-bean cake imports was greatest in 1913 with 7.005 million lb. The quantity of soy-bean oil imports was greatest in 1911 with 41.106 million lb. “Prior to 1914 soy beans were not classified separately in the customs returns” (p. 9). (6) “Composition of soy-bean flour in comparison with wheat flour, corn meal, rye flour, Graham flour, and whole-wheat flour.”

(7) “Value of a short ton of soy-bean cake and other oil

cakes in the principal European countries” (Incl. cottonseed, linseed, peanut {Rufisque}). Countries: Germany, United Kingdom, Netherlands, Denmark, Sweden. (8) “Analyses [nutritional composition] of soy-bean meal and other important oil meals.” (Incl. Cottonseed, linseed (old and new processes), peanut (decorticated), sunflower seed). (9) “Fertilizing constituents [nitrogen, ammonia, phosphoric acid, potash] of soy beans, soy-bean meal, and cottonseed meal.”

(10) Analyses for protein and oil of important varieties of soy beans grown at Arlington Farm (Virginia), Newark (Delaware), and Agricultural College (Mississippi). The varieties are: Mammoth, Hollybrook, Manchu, Haberlandt, Medium Yellow, Ito San, Chiquita, Tokyo, Lexington, Guelph, Black Eyebrow, Shanghai, Peking, Wilson, Biloxi, Barchet, Virginia. Note 1. “At the present time, the Mammoth Yellow variety is most generally grown throughout the South and is the one used in the production of oil” (p. 16). (11) “Acreage, production, and value per ton of cottonseed in the boll-weevil states.” “Since the boll weevil first entered Texas in 1892,” it has steadily decreased production of cottonseed. The soy beans offers a good replacement. (12) “Comparative prices per ton of cottonseed and soy beans on the European market, 1911 to 1914, inclusive.” Soy beans are usually slightly more expensive.

Note 2. This is the earliest published document seen that contains soy-related photos by Frank. N. Meyer.

Note 3. This is the earliest document seen in which William Morse describes soy milk, or mentions natto, or correctly mentions tofu.

Note 4. This is the earliest document seen (Sept. 2004) that mentions the soybean varieties Biloxi or Lexington. Address: 1. Agrostologist in Charge; 2. Scientific Asst. Forage-Crop Investigations, USDA, Washington, DC.

120. Piper, C.V.; Morse, W.J. 1916. The soy bean, with special reference to its utilization for oil, cake, and other products: Soy beans in Japan, in Europe, and in the United States (Document part). *USDA Bulletin* No. 439. 20 p. Dec. 22. [2 ref]

• **Summary:** “Soy beans in Japan (p. 4):... In many districts it is cultivated not in fields by itself, but in rows along the edges of rice and wheat fields. Although not grown to any considerable extent as a main crop by the Japanese farmer, the average annual production is about 18,000,000 bushels. In quality the beans raised in Japan are said to be superior to those of Manchuria and Chosen [Korea] and are used exclusively in the manufacture of food products. The imported beans, of which very large quantities are obtained from Manchuria and other Asiatic countries, are used principally in the manufacture of bean cake and oil.”

“The soy bean forms one of the most important articles of food in Japan. It is one of the principal ingredients in the manufacture of shoyu (soy sauce), miso (bean cheese),

tofu (bean curd), and natto (steamed beans). The beans are also eaten as a vegetable and in soups; sometimes they are picked green, boiled, and served cold with soy sauce, and sometimes as a salad. A ‘vegetable milk’ is also produced from the soy bean, forming the basis for the manufacture of the different kinds of vegetable cheese. This milk is used fresh and a form of condensed milk is manufactured from it. All of these foodstuffs are used daily in Japanese homes and for the poorer classes are the principal source of protein. To a limited extent, soy beans are used as a horse or cattle feed, being sometimes boiled and mixed with straw, barley, and bran.”

“Soy beans in Europe (p. 6): The soy bean was first introduced into Europe about 1790 and was grown for a great number of years without attracting any attention as a plant of much economic importance. In 1875 Professor Haberlandt, of Vienna, begun an extensive series of experiments with this crop and strongly urged its use as a food plant for man and animals. Although interest was increased in its cultivation during the experiments, the soy bean failed to become of any great importance in Europe. At the present time it is cultivated only to a limited extent in Germany, southern Russia, France, and Italy.”

“Soy beans in the United States (p. 7): Although the soy bean was mentioned as early as 1804 (Footnote: Willich, A.F.M. American Encyclopedia, 1st Amer ed., v. 5, p. 13. Philadelphia, 1804), it is only within recent years that it has become a crop of importance in the U.S. At the present time the soy bean is most largely grown for forage. In a few sections, such as eastern North Carolina, however, a very profitable industry has developed from the growing of seed... The yields of seed to the acre in various sections of the United States range from about 15 bushels in the Northern States to about 40 bushels in the northern half of the cotton belt. The average yield in eastern North Carolina is about 25 bushels, although many fields produce 35 bushels or more to the acre...” Note: This is the earliest U.S. document seen (June 2003) that cites the 1804 publication by Willich [and James Mease] concerning the soybean in Philadelphia. Note that this article appeared 112 years after 1804.

“The first extensive work in the U.S. with the soy bean as an oil seed was entered upon about 1910 by an oil mill on the Pacific coast. The beans, containing from 15-19% of oil, were imported from Manchuria, and the importations, most of which are used in the manufacture of oil and cake, have gradually increased, as shown in Table V. The oil was extracted with hydraulic presses, using the same methods employed with cottonseed and linseed. It found a ready market, as a good demand had been created for this product by soap and paint manufacturers, which up to this time had been supplied by importation from Asiatic countries and England. The soy cake, ground into meal, was placed on the market under a trade name and was soon recognized as a valuable feed by dairymen and poultrymen. The use of the

cake has been confined almost wholly to the Western States, owing principally to the high cost of transportation.”

“An industry which promises to be of importance in a further utilization of the soy bean is the manufacture of ‘vegetable milk.’ At the present time a factory in New York State is being equipped for this purpose.” Address: 1. Agrostologist in Charge; 2. Scientific Asst. Forage-Crop Investigations, USDA, Washington, DC.

121. Heinze, B. 1916. Ueber den Anbau der Sojabohne und deren mannigfache Verwendungsart [Cultivation of the soybean and the many ways it can be used]. *Jahresberichte der Vereinigung fuer Angewandte Botanik* 13(Part II):56-76. For the year 1915. [12 ref. Ger]  
Address: PhD, Halle a. d. Saale, Germany.

122. *Weekly News Letter (USDA)*. 1917. Soy bean useful crop. May be utilized in greater number of ways than almost any other agricultural product. 4(27):3. Feb. 7. [1 ref]  
• **Summary:** “The soy bean... may be utilized in a greater number and a greater variety of ways than almost any other agricultural product...”

“In Japan the soybean forms one of the most important articles of food in use. It is one of the principal ingredients in the manufacture of shoyu (soy sauce), miso (bean cheese), tofu (bean curd), and natto (steamed beans). The beans are eaten also as a vegetable and in soups; sometimes they are picked green, boiled, and served cold with soy sauce, and sometimes as a salad. A ‘vegetable milk’ is also produced from the soy bean, forming the basis for the manufacture of the different kinds of vegetable cheese. This milk is used fresh, and a form of condensed milk is manufactured from it.”

In several European countries and to some extent in America, soy-bean “flour enters largely as a constituent in many of the so-called diabetic breads, biscuits, and crackers manufactured as food specialties.

“Soy-bean milk... has been produced in small quantities in the United States, and recently a factory has been equipped to make this product.” In Europe and America soybeans are roasted to make “an excellent substitute for coffee. In Asia the dried beans, especially the green-seeded varieties, are soaked in salt water and then roasted, this product being eaten after the manner of roasted peanuts.”

Soy-bean meal (for use as a stock feed) and soy-bean oil are also discussed. “In addition to its availability as a food, soy-bean oil has found important uses in the markets of the world for making paints, varnishes, soaps, rubber substitutes, linoleum, waterproof goods, and lubricants. It is also used in the Orient for lighting and in the manufacture of printing ink.”

Reprinted in *Jersey Bulletin and Dairy World* 36:323. Feb. 28; *Ohio Farmer* 139:377. March 10; and *Journal of Home Economics* 9:183-4. April. Address: Washington, DC.

123. *Jersey Bulletin and Dairy World*. 1917. Soy bean a useful crop: May be utilized in a greater number of ways than almost any other agricultural product. 36:323. Feb. 28. [1 ref]

• **Summary:** Reprinted from the *USDA Weekly News Letter* 4:3 (7 Feb. 1917). Also reprinted in *Ohio Farmer*, 139:377. March 10; and *Journal of Home Economics*, 9:183-4. April. Address: Washington, DC.

124. *Ohio Farmer*. 1917. Soybeans for human food. 139(10):377. March 10.

• **Summary:** Reprinted from the *USDA Weekly News Letter* 4(27):3 (7 Feb. 1917). Address: Cleveland, Ohio.

125. McClelland, C.K. 1917. Farms and farmers: Soy beans (Continued). *Atlanta Constitution (Georgia)*. March 18. p. A10.

• **Summary:** Discusses soy bean harvesting machinery and uses for human food (shoyu, miso, natto, tofu, and soy bean meal [flour]). Address: Editor & Prof., Experiment, Georgia.

126. *J. of Home Economics*. 1917. The soy bean. 9:183-84. April.

• **Summary:** “The soy bean, already one of the most important crops of Asia, promises to take an important place in the agricultural industry of the United States. It is said that it may be utilized in a greater number and a greater variety of ways than almost any other agricultural product. Not only are the beans, and the oil expressed from them, available as food, but soy bean oil is used for making paints, varnishes, soaps, rubber substitutes, linoleum, waterproof goods, and lubricants, besides its use in the Orient for lighting and other purposes.

“In Japan the soy bean is one of the principal ingredients in the manufacture of shoyu (soy sauce), miso (bean cheese), tofu (bean curd), and natto (steamed beans). The beans are eaten also as a vegetable and in soups; sometimes they are picked green, boiled, and served cold with soy sauce, and sometimes as a salad. A ‘vegetable milk’ is also produced from the soy bean, not only forming the basis for the manufacture of the different kinds of vegetable cheese, but used fresh, while a form of condensed milk is also made from it. All of these food stuffs are used daily in Japanese homes, and for the poorer classes are the principal source of protein.

“Soy bean oil resembles that of cotton seed in many ways. The meal remaining after the oil is extracted from the beans has become important during the last few years as a food of low starch content, and so adapted to the use of diabetic patients.

“Soy bean flour enters as a constituent into many of the so-called diabetic breads, biscuits, and crackers manufactured as food specialties. The flour or meal may

be used successfully in the household as a constituent of muffins, bread, and biscuits in much the way in which corn meal is used.

“An artificial milk like that manufactured in the Orient has been produced in small quantities in the United States, and recently a factory has been equipped to make this product. Such milk may be used for cooking in the household, and by bakers, confectioners, and chocolate manufacturers. Such products must, of course, be properly labeled.

“The soy bean has also been utilized as a substitute for the coffee bean. When roasted and prepared, it makes an excellent substitute for coffee.”

127. *New York Times Magazine*. 1917. Woman off to China as government agent to study soy bean. Dr. Kin will make report for United States on the most useful food of her native land. June 10. p. 9. (New York Times section 6).

• **Summary:** The *New York Times Magazine* is part of the Sunday *New York Times* and may be simply cited as such. Dr. Yamei Kin is “the only Chinese woman with a physician’s diploma from an American college,” the Woman’s Medical College of New York. “She left New York a few days ago for the orient to gather data on that humble but nutritious food [the soy bean] for the Department of Agriculture at Washington.” During World War I, new demands are being placed on America to feed its citizens and allies. “The appointment of Dr. Kin marks the first time the United States Government has given so much authority to a Chinese. That it is a woman in whom such extraordinary confidence is now reposed detracts nothing from the interest of the story.”

China was the first country to invent paper, printing, gunpowder, porcelain, chess, playing cards, and silk. “And now Dr. Kin is going to see if her native land can teach the United States how to develop a taste for the soy bean in its numerous disguises...

“The world is in need of tissue-building foods,’ said Dr. Kin, ‘and cannot very well afford to wait to grow animals in order to obtain the necessary percentage of protein. Waiting for an animal to become big enough to eat is a long proposition. First you feed grain to a cow, and, finally, you get a return in protein from milk and meat. A terribly high percentage of the energy is lost in transit from grain to cow to a human being.”

“The statement is frequently made that the Orientals live almost exclusively upon rice, eating little meat. It is not generally known, perhaps, that deficiency in protein is made up by the consumption of large quantities of products of the soy bean, which take the place in our dietary of meat and other costly nitrogenous foods. They are eaten in some form by rich and poor at almost every meal. Instead of taking the long and expensive method of feeding grain to an animal until the animal is ready to be killed and eaten, in China we take a short cut by eating the soy bean, which is protein,

meat, and milk in itself. We do not eat the plain bean in China at all. It is never eaten there as a vegetable, but in the complex food products—natto, tofu, miso, yuba, shoyu, and similar dishes.

“The chief reason why people can live so cheaply in China and yet produce for that nation a man power so tremendous that this country must pass an Exclusion act against them is that they eat beans instead of meat.”

She then describes how to make tofu. “Soup noodles are made out of bean curd. Entrées made of bean curd are served with cream mushroom sauce or a hot Spanish tomato sauce. A salad of bean sprouts, accompanied by cheese—the cheese [fermented tofu] a cross between Camembert and Roquefort, and made from the soy bean—is very nutritious and palatable. Americans do not know how to use the soy bean. It must be made attractive or they will not take to it. It must taste good. That can be done. We make from it a delightful chocolate pudding. A black soy bean sauce we use as a foundation for sweetmeats in China.” Note: None of the various Chinese food experts whom we have asked can understand what Dr. Kin means by the previous sentence. None has ever heard of a “black soy bean sauce” that is used as a foundation for confections or sweets in China. The two black soy bean sauces made in China, from either soy nuggets or jiang, are both salty. (WRS Jan. 2009). Nevertheless: This is the earliest English-language document seen (Oct. 2008) that uses the term “black soy bean sauce” to refer to a kind of sauce made from soybeans.

“The soy bean contains practically no starch, which means that it is a most desirable food for diabetics, and also, of course, for vegetarians. Buddhists kill no animals—they thrive by making a specialty of the soy bean, which, by the way, is already being used in the French Army. They find there that soy bean mixed with flour makes a good cracker, more nourishing than any other cracker.”

“The Chinese do not know what worn-out soil is. Some places are so fertile and are cultivated with so much care and skill that three or four crops a year are regularly gathered... it is very common to see two crops in the same field at the same time... The Chinese have a passion for fertilizing the soil...”

“Dr. Kin is a graduate of the Woman’s Medical College of New York, and her great interests have always been domestic sanitation, civic hygiene, the conservation of life, and questions of nutrition. She is the head of the Imperial Peiyang Woman’s Medical School and Hospital, near Peking... the Imperial Infant Asylum in Tien-tsin, the Widows’ Home, and the Girls’ Refuge all come under her supervision as head of the woman’s hospital work of Northern China. She will return to this country in October, bringing to our Government the detailed results of her study of the uses of the soy bean as a foodstuff needed by this country and by the world in the campaign of food raising and conservation.” An illustration (line drawing) shows a portrait

of Dr. Yamei Kin.

Note 2. This is the earliest published document seen (July 2000) that mentions Dr. Yamei Kin. Frank N. Meyer wrote letters about her in 1911 and 1916.

Note 3. This is the earliest document seen (Oct. 2001) that mentions a soy pudding (a “delightful chocolate pudding” made from bean curd).

128. Iguchi, Juji. 1917. Nattô no saikingaku-teki narabini kagaku-teki kenkyû [Bacteriological and chemical research on natto]. *Sapporo Norin Gakkaiho (J. of the Society of Agriculture and Forestry, Sapporo)* 9(41):195-216. June. [13 ref. Jap]

Address: Nôgaku-shi, Japan.

129. *Literary Digest*. 1917. To study the soy-bean for Uncle Sam. 55(2):52-53, 55. July 14. Whole No. 1421.

• **Summary:** This is a lengthy summary of an interview with Dr. Yamei Kin, published in *The New York Times Magazine* on 10 June 1917. It includes several lengthy excerpts. “So interested has the United States become in this discovery [China’s knowledge of the soy-bean] that Dr. Yamei Kin, a Chinese woman graduate of an American college, has been sent back home to gather for the Agricultural Department at Washington [DC] all the facts that are known in China about the soy-bean.”

“Instead of taking the long and expensive method of feeding grain to an animal until the animal is ready to be killed and eaten, in China we take a short cut by eating the soy-bean, which is protein, milk, and meat in itself,” says Dr. Kin.

“The plain bean, however, is never eaten, but it furnishes such products as natto, tofu, miso, yuba, shoya [sic, shoyu], and other dishes with queer-sounding names...”

A letter dated 26 March 1917 from Frank N. Meyer in China gives the address of Dr. Mrs. Yamei Kin as 500 W. 111th St., New York City.

130. *Ladies’ Home Journal*. 1917. The most nourishing of all beans. Plant soy beans: They will come in handy next winter. 34:29. July.

• **Summary:** “Now that we are taking stock of our food resources we find these beans a palatable, nutritious food... they make an emergency addition to our daily food and, most important of all, they can be used as a meat substitute. The fact that they contain no starch makes them valuable for invalids who cannot eat starchy foods.”

Soy beans “may be boiled and served as a vegetable, roasted like peanuts and made into soy-bean coffee and soy-bean cheese. There is a soy-bean milk rich in protein, which makes an excellent substitute for condensed milk and is particularly valuable in cooking. There is also a soy-bean oil, which is valuable as a food product.

“The beans may be grown easily in practically all

sections of the country where corn is grown, and they will give heavier yields than most other beans.”

“The dried beans may be purchased now in some markets in various parts of the country, often under the name of togo beans, or Manchurian or Chinese or black beans, but, with the increased acreage which will be given to raising them this summer, will be more generally available.”

“Soy beans have been canned in considerable quantities during the past season, baked with pork, and are on sale in this form in numerous markets. Canned green soy beans, which may be compared with lima beans, also are on the market in some sections of the country.”

“There are several varieties of bean cheese made from the soy bean.” The article then describes how natto and tofu are made and eaten. Gives a recipe for soy beans with bacon and molasses.

Note 1. This article, published about 3 months after the United States entered World War I, is based in part on *USDA Weekly News Letter* (11 April 1917, p. 7).

Note 2. This is the earliest English-language document seen (March 2001) that uses the term “soy-bean coffee” to refer to soy coffee.

Note 4. This is the earliest article on soy seen (Aug. 2002) in *Ladies’ Home Journal* magazine.

131. Park, J.B. 1917. Soybeans as human food: Palatable dishes made from a comparatively new legume. *Ohio Agricultural Experiment Station, Monthly Bulletin* 2(9):299-303. Sept. Extract from Ohio Agric. Exp. Station, Bulletin No. 312, “Soybeans: Their Culture and Use.” [2 ref]

• **Summary:** For details, see Williams and Park. 1917. “Soybeans: Their Culture and Use.” Address: Ohio.

132. Eddington, Jane. 1917. The Tribune Cook Book: Beans, soy special. *Chicago Daily Tribune*. Oct. 14. p. E8 (Part 6, p. 8).

• **Summary:** “We do not know enough about that most charming family of plants which furnish us the meat stuff of the vegetable kingdom, or vegetable protein.”

“Don’t forget the soy bean,” was one of the commands urged on growers this year, ‘for there is sure to be a larger demand for the beans for human food.’ Last year these beans cost no more than a third as much as navy beans and only a fourth as much as limas, and more people were trying them and failing in their cooking than ever before. They really ought never to be subject to a boiling temperature. Protein of any sort is easily hardened by much heat, and these beans have a high per cent of this food principle. With this in mind they may be baked, etc., like navy beans.

“The soy bean, though so long used in China and Japan, whence we have such products as soy sauce, was introduced many years ago into the United States as a soil renewer and fodder crop.”

Years ago, experiment station bulletins were discussing

“the total digestible nutrients” of fodder crops. Yet more than 25 years were to pass “before even a few people would listen to the word ‘nutrient’ in reference to their own diet. ‘Roughage’ was a term much used that far back, as contrasted with such condensed foods as grains, while now we use the term in talking about human diets.”

“Perhaps we shall some time learn to make the bean curd of soy beans which the Chinese use so much. I am hoping to get a precise recipe. The soy bean flour came into use some time ago.”

“The medical writers, who for a considerable number of years have used this bean extensively and written much about it with recipes,” say that the “yellow soy bean” contains 35 per cent protein.

The section titled “Soy bean cheeses” contains a long excerpt from Friedenwald and Ruhrah (1913, p. 124-26), which states that the most common of these “cheeses” are natto, tofu, miso, juba [sic, yuba], and shoyu. A brief description of each is given.

The last section, titled “Home made soy bean flour,” again discusses Friedenwald and Ruhrah, “patent soy bean flour, mostly known to doctors only,” grilled soy beans, diabetics, and a recipe for home made soy flour.

133. Fuerstenberg, Maurice. 1917. *Die Soja, eine Kulturpflanze der Zukunft und ihre Verwertungsmoeglichkeiten* [The soybean, a cultivated plant of the future, and possibilities for its utilization]. Berlin: Paul Parey. 40 p. [59 ref. Ger]

• **Summary:** Dedicated to the Prof. Friedrich Haberlandt, who introduced the soybean to Central Europe. Contents: Foreword. Introduction: The soybean. Ways of using the soybean in its homeland (East Asia, especially Japan and China). Shoyu or soy-sauce. Miso (vegetable cheese). Natto. Tofu of the Japanese or Tao-hu of the Chinese (bean cheese). The soybean as an oilseed. Soybean meal (and flour). Soy as a coffee substitute or extender. Soybean milk. Soy meat substitutes. Soybeans as a chocolate substitute. Soy rubber substitute. The utilization of the soybean in agriculture: As cow fodder. Summary. Bibliography.

Photos show: (1) A field of soybeans (p. 6). (2) A soybean plant with the leaves removed to show the pods (p. 12). (3) Soy beans and pods (p. 13).

Contains numerous tables, mostly from other sources: pages 11, 16-17, 19, 25, 27, 30, 35-37. Contains one of the best early European bibliographies on the soybean.

The author wrote this book during World War I. In his first book, published one year earlier in 1916 and titled “The Introduction of Soya, a Revolution in the Food of the People,” he discussed what he believed to be the great agricultural and nutritional value of the soybean. He uses two terms, *Die Soja* and *Die Sojabohnen* to refer to soybeans.

Chapter 1 (p. 5-7): In 1908 England started to import large quantities of soybeans; in 1909 these increased

to 400,000 tonnes and in 1910 to 800,000 tons. Also in Germany, in the years just before World War I, imports of soybeans climbed in an unexpected way, reaching 43,500 tonnes in 1910, 90,600 tonnes in 1911 and 125,200 tonnes in 1912. Note: These units are given in dz. One dz (*doppelzentner*) = 100 kg.

The first manufacture of soyfoods in Europe took place in France, at Valees near Asnieres, where they made flour, bread, cakes, cheese [tofu], and soymilk (*Mehl, Brot, Kuchen und Käse, vegetabilischer Milch*)—though only in small quantities and, above all, for diabetics. In England, soy flour has been used for a long time in the preparation of cakes (p. 5-6).

However it was in Germany that the utilization of soybeans for food took place on a large scale; this began shortly before the war. The supply of foods to Germany was almost completely cut off during the war, so general attention soon turned to the new foods prepared from soybeans and people quickly became aware of their great nutritional value. Thus, in the middle of the war, a soybean industry was built in Germany. Unfortunately this youngest twig of the food industry was left crippled due to lack of raw materials. However one can predict that this industry has a bright future because of the great encouragement given to these products in so short a time. For example, in October 1914 the *Agumawerke* (Aguma Works) located in Harburg (near Hamburg) on the Elbe, first began mass production of a soy flour according to its own process. During the next few years it made many thousands of tonnes of this meal, until the production had to be stopped for lack of raw materials (p. 6).

Equally gigantic sales of soy products were made by the *Soyamawerke* (Soyama Works) in Frankfurt am Main; this company made only soy food products. In addition to a meal (flour), it also produced a meat substitute (*Fleischersatz*), and, largely from soybeans, fresh and dried milk (*Frisch- und Trockenmilch*) as well as a fresh and dried cream preparation (*ein Frisch- und Trockenrahm-Präparat*). Likewise, this firm had to cease production of most of its soy products because of difficulties in soybean procurement, and concentrate only on the production of meat substitutes (*Fleischersatz*). These articles likewise entered all classes of the population splendidly as is seen from the large demand for them. Within 3-4 weeks this firm had orders for more than 1½ million pound cans, of which unfortunately it was able to satisfy only a small part. In addition to these two well-known firms, there are in Germany still a number others that are occupied with the production of foods from the soybean.

In Austria [the Austro-Hungarian empire], there exists a unique firm, the food factory Santosa in Prague [in the Czech Republic as of Sept. 2002], which is still processing soybeans. They introduced soy coffee into commerce. I understand that in Austria a large-scale soy processing venture is now being planned.

Certainly the soy processing industry finds itself in a beginning state and, like all young industries, in need of improvement. Remember the sugar-beet industry was also once young but it made improvements and went on to great success, as will be expected of this new twig on the food industry. In any case, the beginning of utilization of the soybean as food for the people has been made, and in the foreseeable future the soybean may, as in China and Japan, become an indispensable part of our people's food.

It is different with the introduction of the soybean as a cultivated plant in Central Europe. Forty years ago Friedrich Haberlandt showed (and after him countless others have shown) that the soybean grows well in Central Europe. Although additional new tests verify this, there are still those who object to soybean culture. One objection is the long time required by the soybean to come to maturity; the answer is the development of new varieties. Another is the relatively low yield compared with other beans; the answer lies in the use of inoculation. The author then discusses nutrient yield per acre and per unit of money, showing both to be high for soybeans.

Pages 10-11: It is well known that legumes possess the ability to transform and fix free nitrogen from the air. In 1886 Prof. Hellriegel discovered that this capability is due to certain bacteria that live in the soil and move through the root hairs into the root, where they cause nodule formation. The nitrogen-fixing bacteria living in the nodules nourish the plant. The author then talks about inoculation using either soil from a previous planting or "Nitragin," a pure culture of root bacteria, which is well known and has recently been improved. Dr. Kuehn of Berlin-Grunewald showed that soil inoculated with Nitragin gave a 3- to 4-fold increase in yield, plus an increase in protein in the roots and leaves. He then discusses improved cultural practices. Winkler says that transplanting improves yields. Continued. Address: Frohnleiten, Steiermark [Austria].

134. Fuerstenberg, Maurice. 1917. *Die Soja, eine Kulturpflanze der Zukunft und ihre Verwertungsmöglichkeiten* [The soybean, a cultivated plant of the future, and possibilities for its utilization. Part II (Document part)]. Berlin: Paul Parey. 40 p. 28 cm. [59 ref. Ger]

• **Summary:** Continued on p. 14. Ways of using the soybean in its homeland (East Asia, especially Japan and China): Note: In this section, starting on p. 15, the author repeatedly uses the word *Sojaspeisen* meaning "soyfoods." The soybean probably originated in India. The Chinese and Japanese used it to fortify their rice-based, protein-poor diet. The practice came before the theory. The author says (incorrectly, p. 15) that all the basic soyfoods are fermented. He then gives a long description of koji and how it is made.

Shoyu or soy sauce (*Shoyu oder Soja-Sauce*) (p. 15-17): In Japan, 540-720 million liters are manufactured each year

so each Japanese uses 60-100 ml/year. The fermentation time is 8 months to 5 years. The best soy sauce is fermented for 3 to 5 years. He explains how, as soy sauce is fermented, the protein is broken down into amino acids such as leucine, tyrosine, and members of the "Xanthin" group.

Miso (vegetable cheese, p. 17-18): Miso is widely used in soups. More than half of the yearly Japanese soybean harvest is used for making miso. This is 30 million kg per year. Types of miso include *shiro miso* and Sendai miso. Winkler, in his small work titled "The Soybean of Manchuria," mentions two other types of miso: Aka or red miso and nuka miso. Kellner investigated five types of miso; a table shows their composition. Loew reports that this vegetable cheese (miso) is consumed either raw or in soups. Kellner, Nagasaka and Kurashima report that, based on their investigations, the amount of amino-nitrogen increases 3-fold and the quantity of carbohydrates is significantly diminished through lactic acid and alcoholic fermentation. The carbonic acid created thereby rises significantly during fermentation (Loew).

Natto (p. 18): Discusses the findings of Yabe.

Japanese tofu or Chinese Tao-hu (p. 18-20): This is the so-called "bean cheese" (*Bohnenkäese*). A table (p. 19, from König) shows the nutritional value of fresh tofu (84.8% moisture) and frozen tofu (17.0% moisture). E. Senft studied frozen tofu, a Japanese military preserved food (*Militärkonserve*) that is not canned; he found it had a beige color and a unique, slightly sour aroma which was at times reminiscent of dextrin. It has a uniform texture throughout, with many tiny pores. Winkler refers to five other types of soy cheese. Concerning the military preserved foods, they were highly regarded during the Russo-Japanese War and (according to Senft) played a key role in the war. (Footnote: The descriptions of the various preparations made from soya make E. Senft's treatises (1906 and 1907) valuable; in them he published his investigations of a number of Japanese vegetable foods and military preserved foods or conserves). The well-known food manufacturer Maggi in Kempttal, Switzerland, has tried for many years to introduce a commercial miso-like product, but was not successful.

The soybean as an oil plant (p. 20-26): Winkler, in his brochure, discusses the uses of soybeans in Manchuria. After 1908, soybeans were sold in Europe at incredibly low prices which resulted in the expansion of imports and production. Then tariffs were levied on soybeans. There were some major problems in the Austrian oil industry.

Soybean flour (*Sojabohnenmehl*; p. 26-28): In recent years, various processes have been patented. One manufacturer is Soyamewerke in Frankfurt am Main, which makes *Soyama Kraftmehl*. Yellow soybeans are mechanically cleaned, washed, dried, and dehulled according to the process of Dr. Fritz Goessel. Agumawerke in Harburg also makes soy flour.

The soybean as a coffee substitute and extender (p. 28-



31): Coffee is known to be detrimental to good health and void of nutrients. Rye, for example, has been used since the 17th century as a coffee substitute. Barley also plays a major role, especially as malt. A table (p. 30) shows the nutritional composition of ten coffee substitutes, including chicory, figs, lupin, and carob. Soy coffee tastes remarkably similar to real coffee. In Istria (*Istrien*), in the Austrian alps, in Switzerland as well as in Alsace (*Elsass*), the soybean has been used since its introduction as a coffee substitute. Haberlandt reported in his work that a teacher from Capo d'Istria told him that the soybean was used as a coffee substitute in Istria, and a friend told him that there was no difference between the flavor of the two. The Thunschen is used to make good soy coffee. The soybeans are mechanically cleaned, put into a trommel, agitated with water at 65-70°C, brushed and thereby freed of a large number of impurities which can leave a burned smell. The aroma of soy coffee can be improved by impregnation with an extract of largely decaffeinated coffee. It has roughly twice the nutrients of regular coffee and no harmful constituents.

Soybean milk (*Sojabohnen-Milch*, p. 32-33): The most popular vegetable milk is Dr. Lahmann's Vegetable Milk (*Lahmannsche Vegetabile Milch*), an emulsion made from almonds and nuts. In Japan, they make milk from soybeans; he describes the process, inaccurately, based on information from Winkler. This milk is also used to make cheese [tofu]. Also in Europe there have been successful attempts to make a soymilk adapted to European tastes, as in France by the Caseo-Sojaine at Vallées near Asnieres, and in England by the Synthetic Milk Syndicate. Using the process of Dr. Fritz Goessel, the latter company has a factory in Liverpool; it makes 100 liters of soymilk from: 10 kg ground soybeans plus 5 gm sodium phosphate, 2.4 kg lactose, 2 kg sesame oil, 6 gm common salt, and 60 gm sodium carbonate. Also the Soyamawerke in Frankfurt makes a soybean milk, named Soyama, as mentioned above (fresh and dried milk and cream). Recently Prof. Melhuish developed a new method using soybean, peanuts, and added coconut milk fat.

Soy meat substitutes (*Soja-Fleischersatz*; p. 33): Soyamawerke makes a product named *Soyama-Fleisch-Ersatz*.

Soybean as a chocolate substitute (p. 34): Haberlandt reports such a product.

Soya rubber substitute (p. 34): Goessel and Sauer have developed a rubber substitute made from soybean oil.

The utilization of soya in agriculture (p. 34-38): Use as fodder for cows. In 1880 Blascowicz [Blaskovics], Assistant at the Royal Hungarian Academy in Hungarian Altenburg, conducted fodder tests, whose results are given in various tables.

Conclusions (p. 38).

Note: This is the earliest document seen that uses the word *Ersatz* or the word *Fleischersatz*. They mean "artificial or inferior substitute" and "meat substitute" respectively.

Though often associated with World War I, the word "ersatz" (which means simply "substitute" in German) was actually adopted into English as early as 1875, in reference to the German army's "Ersatz reserve," or second-string force, made up of men unqualified for the regular army and drawn upon only as needed to replace missing soldiers. Hence the meaning "inferior substitute." Address: Frohnleiten, Steiermark [Austria].

135. Lyman, Benjamin Smith. 1917. *Vegetarian diet and dishes*. Philadelphia, Pennsylvania: Ferris & Leach. 416 p. See p. 155-58. Index. Portrait. 21 cm. [3 ref]

• **Summary:** Discusses the physiological, economical, and ethical advantages of a vegetarian diet, with recipes and principles of preparation. The author, who wrote mostly about geology, lived 1835-1920.

A large table titled "Composition of foods" (p. 44-47) gives the percentage of protein, fat, carbohydrates, and ash (on a dry basis) for many foods, including natto, fresh tofu, soy bean-dried, Swiss miso, soy [shoyu] No. 1 and 2, and white miso (all figures from Abel 1900), plus peanuts-dried.

In the chapter titled "Foods of vegetable origin" (p. 141-267), the section on "Pulse" (p. 152-78) contains a subsection titled "Soy bean" (p. 155-58), which begins: "The soy bean of China and Japan is perhaps the most important food plant there, next to rice. The bean is eaten to a small extent boiled like other beans; but is generally elaborated into a variety of products remarkably rich in protein and fat and therefore going well with rice so deficient in those constituents." The following soy-related subjects are discussed, based largely on the writings of others: Soy sauce (Abel), natto (Abel), miso (R. Takahashi), tofu (Abel), *aburage*, *koritofu*, substitutes for milk and cheese, and nutritional comparison with eggs, milk and cheese (Abel, Atwater).

The section titled "Substitutes for milk and cheese" states: "The Chinese in Paris [probably Li Yu-ying] have been urging the culture of the soy bean. The seeds, when boiled, mashed, and pressed, yield both milk and cheese; if thinned with water, a very good substitute for animal milk; and if coagulated with mineral salt, a cheese that is usually eaten fresh, though it may be preserved by salting or smoking, after being cooked. Three varieties of the cheese are common in the oriental markets; a fermented kind [fermented tofu], white, yellow, or gray in color, with a piquant taste, like roquefort; a salty and white kind, like goats' milk cheese; and a third kind, smoky and resembling Gruyère. The soy cheese costs about a fiftieth as much as animal cheese; and in nutritive value, like the vegetable milk, compares very favorably with the ordinary products of the cow. ('Phila. Ledger,' Sept. 27, 1906)."

Note 1. No such article in the *Philadelphia Ledger* or the *Public Ledger* (Philadelphia, Pennsylvania), of this date, can be found.

Note 2. This is the earliest U.S. document seen (Dec. 2008) that mentions smoked tofu.

The section on peanuts (p. 158-62) includes roasted peanuts, peanut butter, peanut taffy, and “Terralac or peanut-milk (here first published).” Details on how to make peanut-milk at home are given, followed by many recipes for its use—each preceded by the word “Terralac.” Thus: Terralac custards, Terralac punch. Terralac cream, salad dressing, sauce, cream sauce, creams, blanc-mange [blancmange], cream pie, Bavarian cheese, Terralac in soup, “Ice-Terralac, or peanut ice-cream,” peanut soup, salted peanuts.

There are also sections on the cowpea (p. 163+), almonds (p. 263-65; incl. salted almonds, marchpane, macaroons, nougat or almond cake, almond milk, orgeat syrup, burnt almonds, replacing almonds), vegetable-gelatin (p. 384-87, incl. carrageen or carrageen [carrageenan], Irish moss, and kanten), sesame oil or gingelly oil (p. 388), peanut oil or groundnut oil (p. 388), almond oil (p. 389), and sago and sago recipes (p. 390-91, incl. three sago puddings).

Note: *Merriam-Webster’s Collegiate Dictionary* (1998) defines orgeat (a word first used in 1754) as “a sweet almond-flavored nonalcoholic syrup used as a cocktail ingredient or food flavoring.”

136. Howell, E.V. 1918. Soy beans and soy bean oil. *J. of the American Pharmaceutical Association* 7(2):159-63. Feb. [14 ref]

• **Summary:** “This bean is a native of southeastern Asia. It is at present the most important legume grown in China and Japan, where it is grown almost exclusively for human food. It has been cultivated from a remote period, each district having its own distinct variety, some two hundred kinds in all... The bean was introduced into England in 1790. Apparently the first mention of soy beans in American literature was in the *New England Farmer*, October 23, 1829, in an article by Thomas Nuttall.” There follows a summary of this article and several other early U.S. documents that mention the soy bean.

“Importance: I think the soy bean is the most important plant introduced into the South within a hundred years. This opinion is based on the range of the plant, the value as a soil improver, and the numerous uses of the seed and oil, together with the fact that the present cottonseed oil mills can produce the oil with practically no change in machinery and thus double their mill season. The beans can be stored, as they are practically immune to insects. Especial emphasis is placed on this statement in the present demand for food on account of the war. In Japan the bean forms one of the most important articles of food, by nature a meat, to go with the starch of rice. The Chinese make from the beans a cheese resembling our own cheese, while the Japanese make the well-known sauce for rice or fish, soy or suey sauce. It is one of the principal ingredients in ‘Tofu’ (bean curd), natto (steamed beans), and white and brown miso, which is like

our molasses brown bread.”

“A factory for the production of this [soy] milk has recently been established in America. This can be used in cooking, by bakers, confectioners, and chocolate manufacturers. I have before me the following food articles in which soy bean meal is the principal ingredient: Egg substitute No. 1, egg substitute No. 2, colored cocoanuts, coffee substitute, cocoa substitute, roasted malted nuts, coloring curry powder, cutlet powder, soy and navy beans with pork, the equal of any pork and beans.

“The use of the soy meal for soups, for proportional use in muffins, cookies, fritters, croquettes, biscuit, and loaf bread is unlimited. Its use is checked only by our prejudice for certain customary flavors, just as northern people and Europeans do not use corn meal. In other words, North Carolina, if forced to by war conditions, could largely exist on the soy beans crushed in the State this year, including the imported and native beans crushed, the oil from which I estimate to yield this year 400,000 gallons. This oil can be used for frying, and for a salad oil in French dressing or in mayonnaise. I fried a partridge in the crude unrefined oil, and found it delicious.

“While the chief use, so far, of the oil has been for soaps and paints, the particular object of this paper has been to call attention to the use of soy oil in pharmaceutical preparations.”

Tables show: (1) The specific gravity, saponification value, and iodine for three samples of Manchurian soy oil purchased in New York. (2) The chemical composition of soy bean meal (8.77% fat), compared with the meal of five other seeds (including cottonseed, linseed {old and new process}, decorticated peanut, and sunflower seed). (3) Four chemical constants of seven samples of domestic and imported soy oils (from L.P. Nemzek). (4) The food values (nutritional composition) of soy beans and six other foods, including lean beef, milk, and eggs.

Because of World War I: “During the past six or seven months there has been produced in this country in the neighborhood of one hundred thousand gallons of soy oil. The largest part of this quantity has been produced in North Carolina by the Elizabeth City Oil & Fertilizer Co., Winterville Cotton Oil Co., and the New Bern Cotton Oil & Fertilizer Mills. Samples from the different crushings have been examined in comparison with the imported oil.”

“Medicinal use: In England a diabetic biscuit is manufactured. In this country an infant’s food from the soy bean is on the market. The enzyme in the bean is also attracting attention and opening a field for investigation.”

Note 1. This paper was presented at the Scientific Section, American Pharmaceutical Assoc., Indianapolis meeting, 1917.

Note 2. This is the earliest English-language document seen (Oct. 2008) that contains the word “crushings.”

137. Itano, Arao. 1918. Soy beans (*Glycine hispida*) as human food. *Massachusetts Agricultural Experiment Station, Bulletin* No. 182. 10 p. March. [16 ref]

• **Summary:** Contents: Introduction. Chemical composition and digestibility. Human food prepared from soy beans (practical recipes for making Japanese foods at home; names in parentheses indicate the Japanese name). Soy bean milk (*Toniu*): The ordinary method employed in Japan, toniu from soy bean meal (made by grinding soybeans in a wheat flour mill or fine coffee mill), author's method [from soy bean meal, plus inoculation with *Bacillus coli* and *B. lactis aerogenes*], synthetic toniu, condensed soy bean milk (condensed toniu). Evaporated soy bean milk (*yuba*). Soy bean curd (*tofu*): Fresh curd (*tofu*), frozen *tofu* (*kori tofu*), fried *tofu* (*abura-age*). Baked beans. Boiled beans. Roasted beans. Powdered beans: Roasted, or raw (soy bean meal). Green beans. Soy bean pulp (*kara*). Fermented boiled beans (*natto*). Ripened vegetable cheese (*miso*; discusses *koji*). Soy bean sauce (*shoyu*). Vegetable butter, ice cream, oil (table use) and lard (cooking): "The manufacture of these articles from soy beans needs further investigation."

Concerning "Baked beans" (p. 7). "1. Soak the beans, suspended in a cloth bag, in a large quantity of hot water over night. (Soaking for twenty-four hours in ice-cold water which is changed occasionally will give the same result.) 2. Change the water, when hot water is applied, in the morning and an hour or two before cooking. 3. Add 1 teaspoonful of soda [sodium bicarbonate] per quart of beans and boil until the beans become soft. 4. Bake like other beans. Note.—The characteristic strong flavor of the beans is removed by soaking before cooking; the addition of soda [sodium bicarbonate] makes the beans soft. Cooking with salt pork, potatoes, onions, molasses and other substances makes the beans more palatable to some tastes."

Concerning the "Roasted beans" (p. 7). "1. Roasting can be done either in an oven or in an ordinary corn popper. 2. Roast until the skin of the bean is burst by popping. Note.—The beans can be kept soft by immersing them in a syrup while they are hot. Thus very wholesome candy is prepared."

Concerning the "Powdered beans: Roasted" (p. 7). "1. Roast as in the roasted beans. 2. Let them stand until they cool to harden them. Grind them in a coffee mill or other suitable grinder. Note.—The powder can be used as a salad dressing or cooked [baked] with cookies like peanuts and other nuts, or employed as a substitute for coffee." Note 1. This is the earliest English-language document seen (Dec. 2005) that uses the term "Powdered beans: Roasted" to refer to roasted soy flour.

Concerning "Green beans: 1. Pick them when the beans are three-fourths to full grown. Boil them in salt water. 3. Discard the pods. 4. Serve the beans with butter or milk. Note—The pods are tough and they can be removed easily on boiling."

Concerning "Soy bean pulp (*kara*): 1. This is the residue

after the milk is extracted in the process of preparation of soy bean milk. 2. Cooked like any other vegetable with proper seasoning. Note.—Makes a very rich dish; an addition of green onions, cabbage or parsnip may improve it."

Tables contain chemical composition analyses.

Note 2. This is the earliest English-language document seen (March 2007) concerning soy ice cream, which it calls simply "ice cream." This is also the earliest document seen (March 2007) concerning the etymology of soy ice cream.

Note 3. This is the earliest English-language document seen (Oct. 2001) that uses the term "soy bean pulp" to refer to *okara*.

Note 4. This is the earliest English-language document seen (Feb. 2004) that uses the word "*kori tofu*" to refer to dried-frozen *tofu*.

138. *USDA Bureau of Plant Industry, Inventory*. 1918. Seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from January 1 to March 31, 1915. Nos. 39682 to 40388. No. 42. 123 p. April 17.

• **Summary:** Soy bean introductions: *Soja max* (L.) Piper. Fabaceæ. (*Glycine hispida* Maxim.)

"39967-39982. From Soochow, China. Presented by Mr. N. Gist Gee, Soochow University. Received February 11, 1915. Quoted notes by Mr. Gee, except as otherwise indicated. "39967-39972.

"39967. '(No. 1. *Kua shu tou* (*Kwa zoh*). Melon-ripe bean.) This is so named because of its time of ripening. Seeds are sown about the first of May and cropped late in June when melons are ripe. Used only as a vegetable.'

"39968. '(No. 2. *Chia chia san tou* (*Kah kah sen*). Pod pod three bean.) Planted in the middle of May and reaped during September. Used as a vegetable and for manufacturing of oil.'

"39969. '(No. 3. *Hung hsiang chih tou* (*Ong sing sze*). Red familiar bean.) These are "Loving beans," as the characters suggest. Planted in the middle of May and harvested about September. Used both as vegetables and in the manufacture of oil.'

"39970. '(No. 4. *Hei tou* (*Huk*). Black bean.) Owing to their color, these are called "Black beans." Planted in the first part of June and reaped in the middle of October. Used as a vegetable and in the manufacture of oil.'

"39971. '(No. 5. *Ku li ch'ing* (*Kwa lea ching*). Bone inside green.) Planted early in June and harvested in late October. Used only in making oil.'

"39972. '(No. 6. *Shih tzû ho tou* (*Zee tee 'ah*). Persimmon-seed bean.) Planted in the first part of June and cropped in the middle of September. They are largely used as vegetables.'

"39974-39977.

"39974 '(No. 8. *Pa yüeh pai tou* (*Gee buh*). Eight-month white bean.) The combined meaning of its color and its time of ripening indicates the name. Planted in May and harvested

in September, which is the eighth month of the Chinese calendar. Used to make oil. This and No. 9 [S.P.I. No. 39975] are the best two for oil manufacture.’

“39975. ‘(No. 9. *Shui pai tou* (*Gee buh*). Water white bean.) Planted in late May and reaped in September. Used to manufacture oil; one of the best two for oil manufacture.’

“39976. ‘(No. 10. *Niu t’a pien* (*Nue duh pea*). Cow crush flat.) Its use and time of harvesting are the same as those of the *Gee buh* [S.P.I. No. 39975]. The beans are trodden out by cows; hence the name.’

“39977. ‘(No. 11. *Wu ch’iao tou* (*Oh tsah*). Sparrow’s cackling (or magpie) bean.) Planted about the last part of June and cropped in mid-October. Used largely to make oil.’”

“39982. ‘(No. 16. *Lü tou* (*Loh*). Green bean [mung].) Planted in the early part of June and cropped early in September. Used the same as the *Ch’ih tou* [S.P.I. No. 39980]. Called “green bean” because of its color, probably.’”

“40106/40138. From Wakamatsu, Iwashiro, Japan. Presented by Rev. Christopher Noss. Received March 8, 1915. Quoted notes by Mr. Noss. ‘From an exhibition in Kawamata, near Fukushima City.’

“40106-40127.

“40106. ‘*Mochidaizu* (*dai*, large; *zu*, bean [daizu = soybean]), used in *mochi* (glutinous rice boiled and pounded in a mortar).’

“40107. ‘No. 2. *Nakatedaizu* (second early), used in *miso* (beans, etc., pickled in salt and made into soup), *tofu* (bean curd).’

“40108. ‘No. 3. *Shichi-ri-korobi-daizu* (20-mile rolling), used for *tofu*, *soy*, and *miso*.’

“40109. ‘No. 4. *Yuki-no-shita-daizu* (under the snow), used for *tofu*, *soy*, and *miso*.’

“40110. ‘No. 5. *Wasedaizu* (early), used for *tofu*, *soy*, and *miso*.’

“40111. ‘No. 6. *Misodaizu*.’

“40112. No. 7. *Ko-tsubu-daizu* (small grain), used for *miso* and *natto* (buried, fermented, and eaten as a relish).’

“40113. ‘No. 8. *Kinako-daizu*, made into *kinako* (a flour used in cooking) and also *natto*. Said to have been brought by soldiers from Manchuria.’

“40114. ‘No. 9. *Tamazukuridaizu* (name of a country near Sendai), used boiled.’

“40115. ‘No. 10. *Asahidaizu* (morning sun), used for *natto*.’

“40116. ‘No. 11. *Darumadaizu* (*Dharuma* [Bodhidharma], whose image was a roly-poly, can not be upset), used boiled and for *tofu*.’

“40117. ‘No. 12. *Taiwandaizu* (*Formosa*), used boiled.’

“40118. ‘No. 13. *Hato-koroshi-daizu* (dove killer), used boiled.’

“40119. ‘No. 14. *Usu-ao-daizu* (light green), used for *kinako* and boiled.’ Note: This soybean might give naturally greenish *kinako*.

“40120. ‘No. 15. *Ao-daizu* (green), used for *kinako* and boiled.’

“40121. ‘No. 16. *Aka-kuki-daizu* (red stalk), used for *natto* and *miso*.’

“40122. ‘No. 17. *Fuku-shiro-daizu* (clothing white), used for *tofu*.’

“40123. ‘No. 18. *Hachi-ri-han-daizu* (21 miles), used boiled. The name *Hachi-ri-han-daizu* involves a curious play on words. *Hachi-ri-han-daizu* means “eight ri (a ri is 2.5 miles) and a half,” which is just a little short of *ku-ri*. Now *ku-ri* means nine ri, and *ku-ri* also means chestnut, so the expression in question means that the beans so named are almost equal to chestnuts.’

“40124-40127. ‘Beans are used boiled.’

“40124. ‘No. 19. *Yoshiwaradaizu* (harlot quarters in Tokyo).’

“40125. ‘No. 20. *Chadaizu* (tea, alluding to the color [brown]).’

“40126. ‘No. 21. *Kichidaizu* (lucky).’

“40127. ‘No. 22. *Kurodaizu* (black).’”

“40370-76. From Wakamatsu, Iwashiro, Japan. Presented by Rev. Christopher Noss. Received March 27, 1915. Quoted notes by Mr. Noss.

“40370. ‘No. 33. *Hikagedaizu* (shade), produces in shady places; used for *miso*.’

“40371. ‘No. 34. *Dekisugidaizu* (excessive yield); used for *miso*.’

“40372. ‘No. 35. *Kurodaizu* (black); eaten boiled and sugared.’

“40373. ‘No. 36. *Nakatedaizu* (medium early); used for *miso*.’

“40374. ‘No. 37. *Hishidaizu* (water caltrop, alluding to the flattened shape); eaten parboiled and seasoned with *shoyu* and salt.’

“40375. ‘No. 38. Name unknown, cultivated from ancient times in Soma County, Fukushima Ken; used for *miso*.’

“40376. ‘No. 39. *Hakodate-nishiki-daizu* (*Hakodate* brocade); used for *miso*.’” Address: Washington, DC.

139. Thurston, Azor. 1918. Soya bean oil. *Midland Druggist and Pharmaceutical Review* 52(5):202-03. May. [3 ref]

• **Summary:** This oil is called *huile de soja* in French, *Sojabohnenoel* in German, and *olio di Soia* in Italian. “Soya beans are cultivated in Russia, Japan, China and the Southern part of the United States. Constants: Refractive index at 20°C, 1.4768; specific gravity at 25°C, 0.9194; solidification value, -15 to -16°C; saponification value, 191 to 194; iodine value, 130 to 135; Reichert-Meissl value, 0.45 to 0.69. Principal components: Glycerides of oleic, linolic, stearic and palmitic acids.” After discussing the oil’s preparation, properties, and tests of purity, the author describes its uses: “Soya bean oil is used in soap making, in paints and varnishes as well as in making waterproof clothing. It is used

as an edible oil in the manufacture of lard substitutes and oleomargarine. It is used to a limited extent as a lubricant and burning oil. ‘German Coffee Berry’ is a species of soya bean the seed of which, being parched and ground, is used as coffee. As a by-product the soya-bean meal is a valuable stock food.” He then discusses natto, based on a 1912 article by S. Muramatsu. He adds, incorrectly, that “Tofu is a liquid preparation resembling cow’s milk and manufactured from soya beans.”

Note: Azor Thurston lived 1861-1922. Address: Ohio State Univ.

140. Evans, W.A. 1918. How to keep well. *Chicago Daily Tribune*. Aug. 28. p. 6.

• **Summary:** “Soy beans offer large possibilities as a food. They contain 17 per cent fat, 36 per cent proteid, and 14 per cent starch. Soy bean milk has been used for feeding children for a long time. Le Wall says that soy bean cheese and soy bean croquettes resembling meat croquettes are in use. According to the same author, soy bean is the basis of Worcestershire and other sauces. Among orientals soy bean foods are: Tashir, a bean natto and miso, also soy bean cheeses. Ordinary soy milk and Yuba or soy cream are in use. Shoyer [sic, shoyu] is an oriental sauce in making which soy beans are used.” Address: Dr.

141. *Virginia Department of Agriculture and Immigration, Bulletin*. 1918. Soy bean useful crop. May be utilized in greater number of ways than almost any other agricultural product. No. 126. p. 174-76.

• **Summary:** “In addition to its availability as a food, soy-bean oil has found important uses in the markets of the world for making paints, varnishes, soaps, rubber substitutes, linoleum, waterproof goods, and lubricants. It is also used in the Orient for lighting and in the manufacture of printing ink. In Japan the soy bean forms one of the most important articles of food in use. It is one of the principle ingredients in the manufacture shoyu (soy sauce), miso (bean cheese), tofu (bean curd), and natto (steamed beans). The beans are eaten also as a vegetable and in soups; sometimes they are picked green, boiled, and served cold with soy sauce, and sometimes as a salad. A ‘vegetable milk’ is also produced from the soy bean, forming the basis for the manufacture of the different kinds of vegetable cheese. This milk is used fresh, and a form of condensed milk is manufactured from it. All of these foodstuffs are used daily in Japanese homes, and for the poorer classes are the principle source of protein.”

“An artificial milk like that manufactured in the Orient has been produced in small quantities in the United States, and recently a factory has been equipped to make this product.” Photos show: (1) Soy beans as a forage crop, arranged in stacks. (2) Lime spreader at work. Address: Virginia.

142. Hanzawa, Jun. 1919-1921. *Nattô*. I-III gô [Natto. I, II, and III.]. Sapporo, Hokkaido, Japan: Sapporo Nattô Yôki Kairyôkai. [Jap]\*

• **Summary:** In 1919 Dr. Jun Hanzawa, of Hokkaido University’s Department of Agriculture, published the first of three key reports which helped to bring natto production in Japan out of the “Dark Ages.” Serving simultaneously as a microbiologist, and extension worker, and a pilot plant operator, Dr. Hanzawa began by making a pure-culture bacterial inoculum for natto; this enabled commercial natto manufacturers, for the first time, to discontinue the use of rice straw as a source of inoculum.

Secondly, disliking the use of rice straw even as a wrapper, he developed a simple, low-cost method for packing, incubating, and selling natto wrapped in paper-thin sheets of pine wood (*kyogi*) or small boxes of pine veneer (*oribako*).

A third important improvement followed shortly; the development of a new incubation room design (*bunka muro*), which had an air vent on the ceiling and substantially decreased the natto failure rate. These three developments laid the basis for modern industrial, sanitary, scientific natto manufacture.

Commercial natto makers filled his classes and he worked as a consultant for them. Like Dr. Muramatsu before him, Dr. Hanzawa sold his “University Natto” from his research lab, promoting it as a rival to cheese. He was given the appellation of “the father of modern natto production.”

In 1971 he was given the honor of addressing the emperor of Japan on the subject of natto. Address: PhD, Dep. of Agriculture, Hokkaido University.

143. Rindl, M. 1920. Vegetable fats and oils. IV-V. Semi-drying oils. Soy bean. *South African J. of Industry* 3(6):518-31. June; 3(8):742-49. Aug. [29 ref]

• **Summary:** These are 2 installments of a series of articles on vegetable fats and oils, forming a Report to the Advisory Board of Industry and Science on Vegetable Oils, Fats, and Waxes. Soybeans are considered among the semi-drying oils. Contents of Part I: Introduction. Early [soybean] experiments in South Africa. Botanical characters. Varieties. Germination. Inoculation. Technique of inoculation. Soy beans as a rotation crop for maize. Comparison of soy beans and cowpeas. Storage of seed. The soy bean as human food. Vitamines. Soy-bean [food] preparations: Soy-bean milk, soy-bean curd [tofu], the soy bean as a vegetable (baked, boiled, roasted, green beans [green vegetable soybeans], soy-bean pulp (kara)). Soy-bean meal [soy flour and its uses]. Fermented soy-bean products: Fermented boiled beans (natto), ripened vegetable cheese (miso), the Chinese paste chiang, soy-bean sauce (shoyu).

Contents of Part II: Oil content of seed produced in South Africa. Quality of oil from South African beans. Extraction of oils. Nature and composition of soy-bean oil,

and methods of treatment. Uses of the oil. Soy beans as forage. Enemies of the soy bean. Method of shipment from the East.

“The first systematic trials [with soy beans] were initiated about 1903 at Skinner’s Court, on the Springbok Flats, and at the Natal Experiment Farms, Cedara, Weenen, and Winkle Spruit. These latter were continued until the season 1910-1911 when the field trials referred to above [by the Transvaal and Natal Departments of Agriculture] were carried out by the Department of Agriculture in conjunction with Messrs. Lever Bros. and a large number of farmers” (p. 519).

The best yields during the 1910-11 season at the three Natal Experiment Farms were: At Cedara: Haberlandt 2,000 lb/acre. Winkle Spruit: Mammoth Yellow 1,191 lb/acre. Weenen: Mammoth Yellow 1,400 lb/acre.

“Method of shipment from the East. The beans are shipped in bags, vessels are well dunnaged, and a large number of wooden pipe ventilators are placed in the ships’ holds to keep the cargo from getting heated. The beans, on a long voyage from Eastern Asia to Europe, being liable to sweat, are sometimes dried before shipment.”

Tables show experimental yields and chemical compositions of soy beans from different countries and soy-related products. A diagram (outline-form) shows the various ways in which plants and seeds of soy beans are utilized. Note: This is the earliest English-language document seen (Feb. 24) that uses the term “soy-bean curd” to refer to tofu. Address: Ing. D., Prof. of Chemistry, Grey University College, Bloemfontein [Orange Free State, South Africa].

144. Ubbelohde, Leo. 1920. I. Oele und Fette aus Pflanzen. B. Schwachtrocknende Oele [I. Oils and fats from plants. B. Semi-drying oils]. In: Leo Ubbelohde & F. Goldschmidt, eds. 1920. *Handbuch der Chemie und Technologie der Oele und Fette: Chemie, Analyse, Gewinnung und Verarbeitung der Oele, Wachse und Harze. II. Band* [Handbook of the Chemistry and Technology of Oils and Fats: Chemistry, Analysis, Extraction, and Processing of Oils, Fats, Waxes, and Resins. Vol. 2]. Leipzig, Germany: Verlag von S. Hirzel. p. 137-322. See p. 282-93. Illust. Index. 25 cm. [Ger]

• **Summary:** No. 182, “Soybean oil (*Sojabohnenöl*),” has the following contents: Names: *Huile de Soja. Soja bean oil. Chinese bean oil. Olio di Soia*. Introduction: Botanical, varieties, culture, composition of the beans (2 tables), lecithin content, urease. Various preparations from soybeans: European (Sarton powder / Sartonpulver made by Bayer & Co.; Soyap made by Firma Zinnert), Asian (flour, bread, milk, cheese, canned / tinned foods, soya sauce {*Sojasauce*} and the so-called soya-quark {*Sojaquark*} [tofu, containing 72.1 to 73.0% water], natto), diabetic bread, soy sauce. Production of soybean oil. Properties of soybean oil. Use of soybean oil. Soybean cake (*Sojabohnenkuchen, Sojakuchen*). Commerce and trade.

Also discusses: Sesame oil (p. 196-206). Address: 1. Prof. Dr., Karlsruhe [Germany].

145. Adkins, Dorothy Margaret. 1921. The soya-bean problem. *Science Progress (London)* 15(59):445-51. Jan. [9 ref]

• **Summary:** This is a popular article. Contents: Introduction. Practical applications of the bean: Food uses include Tofu, or bean cheese (Japanese), Miso similar to chiang (Chinese), Shoyu (Japanese) and chiang-yu (Chinese), Natto (Japanese), whole dry soybeans, soybeans canned as a green vegetable (see description below), vegetable milk, soya-beans roasted, ground and used as a coffee substitute in Switzerland and the USA, soya flour, soya in diabetic diets and macaroni. Utilisation of soya-bean oil: In Italy, China, Manchuria. Utilisation of soya-bean cake and meal: As fertilizer in China and Japan, for feeding stock. Food value of the bean. The cultivation of the soya bean: China, Japan, United States, Australia (New South Wales), South Africa, West Indies, British East Africa, West Africa, Burmah [Burma], England.

“In Japan beans are germinated until the sprouts are about five inches long, and eaten with vinegar; beans, germinated and treated with brine, have also been noted in Spain.” Note: It is not stated clearly that these beans in Japan or Spain are soya beans.

“Soya-beans may be cooked and used in the same way as haricot-beans, and may also be picked when young and treated like green peas, in which condition they may be canned.”

“In South Africa success has been achieved in growing the plant; in 1910 the outlook was so hopeful that a project for constructing oil mills was suggested. Unfortunately the bean was not taken up by farmers, who preferred to cultivate maize, as it was an easier crop to produce. Thus no extensive culture of the bean was attempted, and the subject was dropped.

“In other parts of the Empire, for example the West Indies, British East Africa and West Africa, trials of soya-beans have proved successful, but in no district have promising early experiments been followed by tests on a larger scale.”

“In certain parts of India, for example Burmah, soya-beans are grown on a large scale and are consumed by the natives.”

Note: “Lower Burma is a historical region, referring to the part of Burma annexed by the British Empire after the Second Anglo-Burmese War, which took place in 1852... Lower Burma was centered at Rangoon, and composed of all of the coast of modern Burma, and also the lower basin of the Irrawaddy River, including Prome. The area was also known as British Burma” (Source: Wikipedia, Oct. 2010). Address: Royal Holloway College, London.

146. Henmi, H. 1921. *Nattô no kôso ni tsuite* [The enzymes

of natto]. *Sapporo Norin Gakkaiho (J. of the Society of Agriculture and Forestry, Sapporo)* 13(57):121-38. June. [5 ref. Jap]

Address: Sapporo, Japan.

147. Satow, Sadakichi. 1921. Researches on oil and proteids extraction from soy-bean. *Tohoku Imperial University, Technology Reports (Sendai, Japan)* 2(2):1-124 (41-164). Oct. 28 cm. [Eng]

• **Summary:** Contents: 1. General description of the soy-bean: The use of the soy-bean (as a food-stuff [shoyu, miso, tofu, natto], soy bean oil [for the manufacture of soap, hydrogenated oils, paints, varnishes, oil-cloth, and rubber substitutes], and bean cake or waste residue from the manufacture of soy-bean oil [nitrogenous fertilizer, as a cattle food, Solite—a water-based paint]). 2. Classification and analysis of soy beans and their standardization: By color, by protein / proteid content, conclusion of analysis (the best soy-beans are Tsurunoko and Kauro grown in Hokkaido): Standardization of the raw material, content of proteids, color of the raw material, moisture, regularity of the grain, specific gravity of the soy-bean, impurities. 3. Microscopical observations of soy-beans: Colour reactions of cellular substances, distribution of proteids and fatty acids, distribution of fatty oils. 4. Oil extraction (p. 17): Influence of hulls, influence of moisture, influence of oxidation, comparison of the dissolving power of various solvents, to find the best conditions for the extraction of oil by means of benzine, how to extract the oil technically without denaturing the proteids and how to remove the retained solvent, on the apparatus employed in oil extraction, working of the extracting apparatus, recovery of solvent by application of the vacuum system, separation of oil from the solvent and oil refining, reserving the oil-freed soy-bean meal.

5. Isolation of proteids out of oil-freed soy-bean (p. 35): General discussion, necessary and sufficient conditions for the extraction of proteids (on the quality of isolated proteids [plasticity, solubility, coloration], on the purity of isolated proteids, to obtain a maximum yield). 6. The extraction of proteids by means of water (p. 41): General properties of bean meal, on gummy substances and their properties (saccharo-colloids, incl. stachiose [stachyose], araban, galactan; p. 43), quantitative estimation of water-soluble proteids and carbohydrates, determination of the volume of water necessary for the extraction of soluble carbohydrates, relation of the duration of extraction to the quantity of extractable proteid and carbohydrates, effect of the process of water-extraction. 7. On the extraction of proteids by means of alkaline reagents: General properties of glycinin against alkaline reagents, classification of alkaline reagents, comparisons of dissolving power of alkaline reacting compounds, relations of the plasticity and coloration of the proteid to various kinds of extracting agents, standardization of plasticity of isolated proteid, on the relations between

plasticity and chemical reagents, comparative experiments relating to the extracting process by means of sodium sulfite and sodium hydroxide.

8. The determination of the concentration, quantity, and other factors of  $\text{Na}_2\text{SO}_3$  [sodium sulfite] in the process of extraction (p. 69): Determination of the concentration of sodium sulfite, the determination of the relation between the plasticity of the protein and the concentration of sodium sulphite, to determine the relation between the yield and the time of extraction, to find out the actual yield of proteid, as well as the volume of sodium sulfite solution provided the bean meal is previously extracted by water, then extracted with sodium sulphite, conclusion of this chapter. 9. Extraction of proteids by means of caustic alkalies [alkalis] (p. 80): To determine the concentration of the caustic soda [sodium hydroxide] solution, determination of the relation between the time of extraction and the yield of proteid, to determine the volume of caustic soda, the systematic extraction of proteids (using water, sodium sulphite, or alkali). 10. Clarification of extracted proteid solution and precipitation thereof (p. 86): Precipitation of proteids, precipitation by means of alkaline earth metals (such as magnesium sulphate), by means of colour base (such as malachite green, methyl violet, brilliant green, auramine, or new fuchin), by means of alcohol, by means of heating, by means of formaldehydes, by means of fermentation, by means of acids (choice of acid, yield of precipitated proteid, quality of proteid). 11. Quantitative investigations on the precipitation of proteids (p. 101, 11 experiments with summary of conclusions). 12. Effect of heating on the yield of proteid (p. 115). 13. Separation of excess water from the proteidal precipitate (p. 118). 13A. Process for drying the proteidal mass and for drying the residue (p. 121). 14. Pulverizing the dried proteid (p. 122). 15. Recovery of carbohydrates from waste liquid (p. 123).

World soybean production (in short tons): Manchuria 1,850,000 (25% is used in Manchuria as food; 75% is exported to all parts of the world in the form of “bean cakes or bean meal”). Japan 450,000. Korea 322,500. Kantoshu 15,400. Total of the above: 2,640,000 tons valued at more than 200 million Japanese yen (p. 2).

The author investigated the use of soy-bean proteins in plastics. There are upwards of 30 varieties of soybeans which may be classified into yellow, blue, and black. The first contain the most protein and oil, the last the least. The protein content varies from 35-40.5% and the oil content from 15.4 to 20.9%. The mean analysis of 16 different varieties was: Water 10.2%, proteins 37.8%, oil 18.9%, carbohydrates 23.5%, fiber 5.2%, and ash 4.4%. The carbohydrates consist mainly of non-reducing sugars with little or no starch. The cell membrane consists of galactan or hemicellulose, with a little free cellulose. The presence of the hulls in the crushed bean reduces the speed of extraction of the oil and the yield, and gives the oil and protein a brown

color. Note: This is the earliest document seen (May 2004) containing the word “hemicellulose.” *Webster’s Dictionary* defines hemicellulose, a word first used in 1891, as “any of various plant polysaccharides less complex than cellulose and easily hydrolyzable to simple sugars and other products.” The sugar molecules in this polymer each contain 5 carbon atoms.

Oil extraction: Benzene is the most suitable commercial solvent; the solvent must not be recovered by direct steaming of the meal, but by the use of a vacuum.

Protein extraction: The soluble carbohydrates are removed from the meal by washing with very dilute acetic acid. The protein is then extracted in 3 stages, i.e. with water, with 0.2-0.4% sodium sulphite solution, and with 0.2% sodium hydroxide solution. 20-30% of the total available protein is extracted in the first stage, a further 50% in the second, and the total yield is about 95%. The protein is finally dried at the lowest temperature and highest vacuum and in as short a time as possible. The dry protein is very tenacious and can only be ground in high-speed disintegrators; it is then suitable for the manufacture of plastic materials, lacquer, enamel, or imitation leather. The soluble carbohydrates, which amount to 10-12% of the meal treated, can be worked up into syrup or converted into alcohol or lactic acid by fermentation. The bean residue consists of fiber, galactan, and protein and can be used for cattle feed or as an ingredient of linoleum-like products.

Note: This is the earliest document seen (Sept. 2010) concerning isolated soy proteins (other than simply isolation as part of nutritional research).

Continued. Address: Kôgakuhakushi.

148. Satow, Sadakichi. 1921. Researches on oil and proteids extraction from soy-bean: Illustrations and tables (Continued). *Tohoku Imperial University, Technology Reports (Sendai, Japan)* 2(2):1-124 (41-164). Oct. 28 cm. [Eng]

• **Summary:** Continued: Illustrations show: (1) The cells of the soy-bean (after Winton, p. 55). (2) The effect of various chemicals on soy-bean cells (8 figures, after p. 16). (3) A rotary drum extractor used with solvent and a vacuum system (p. 68). (4) An endless belt system for drying proteid precipitate.

Tables show: (1) Percentage of proteids and fat found in 23 samples of beans. The varieties are: Akakiji bean, Nagaaneko bean, Kintoki bean, Shônembo bean, Biruma ingen bean, Chûnembo bean, Maru uzura bean [speckled], Naga uzura bean, Kumamoto ingen bean, Azuki, Chûnaga uzura bean, Aneko bean, Shiromarufuku bean, Green pea, Dainenbô bean, Daifuku bean, Chûfuku bean, Red pea, Black soy-bean (38.61%), Yellow soy-bean from Manchuria {2 samples, 38.65% and 39.12%}, Yellow soy-bean from Korea (41.00%, and 22.826 fat—the highest fat of any bean tested), Yellow soy-bean from Hokkaido, Japan (41.92%—the

highest proteid of any bean tested) (p. 6-7). (2) Previous analyses of the chemical composition of 16 soybean samples from Manchuria, Korea, and Japan. For each, gives the district, variety (mostly yellow but one “Blue variety”), water, proteids, fat, carbohydrate, fiber, ash, name of analyst (an organization) (p. 8). (3) Analyses by Sato of the chemical composition of 14 soybean varieties from Manchuria, Korea, and Hokkaido (Japan). For each, gives the varietal name, growing region, “moisture, total protein, soluble proteose, available protein, non-proteid nitrogenous matter, fat, nitrogen-free extract, fiber, ash, color and shape (all yellow), producing organization (Korean Central Experimental Station or Sapporo), date of production. Named varieties include: Harupin, Shoshu bean, Utsuzan bean, Ampen bean, Chogei bean, Ryusan bean, Turunoko [Tsurunoko], Kanro, Yoshioka, Otanizi [Otaniji] (41.92% total protein and 37.53% available protein, both the highest of any bean tested) (p. 11). (4) Effect of hulls on solvent extraction of soy-bean oil with 3 varieties: Kanro, Otaniji, Yoshioka (p. 18). (5) Influence of moisture on solvent extraction (ether) of soy-beans (p. 19). (6) Effect of using benzine in place of ether in solvent extraction of soy-bean oil. The best moisture content is 7.5% to 12.5% (p. 20). (7) Substitution of vacuum drying for open air drying in removing moisture. Shows that the smaller the quantity of moisture contained in the bean, the greater the yield of oil, provided that the oil is protected from oxidation (p. 22). (8) Effect of different solvents on oil extraction: Carbon bisulphide (flammable and expensive), ether (flammable and expensive), benzine (boiling point 75°C), carbon tetra chloride [tetrachloride]. (9) Separation / distillation of benzine from oil solution (p. 34).

(10) Chemical composition of “soy bean meal” from which the hull and oil have been removed (p. 42). (11) Composition of carbohydrates or saccharo-colloids, based on S. Yukawa (p. 43). (12) Composition of para-galacto-araban / gummy substances in 9 varieties (p. 44-45). (13) Percentage of water-extractable substances and reducing sugars in flattened and powdered soy-beans (p. 46-47). (14) Sugars in soy-beans (p. 48). (15) Proteids and soluble carbohydrates in soy-beans (p. 49). (16) Effect of acetic acid in retarding dissolution of the globulins (p. 50). (17-18) Dissolving power of alkaline reagents on proteids in bean meal (p. 54-56). (19) Effect of reagent on plasticity and coloration of proteids (p. 56).

(20-22) Amount of proteid extracted in 3 consecutive extractions, or with pressure (p. 63-65). (23) Effect of 4 consecutive washings in removal of ash (p. 66, 68). (24-26) Percentage of proteid extracted with sodium sulfite after 1 or 2 hours (p. 70-71). (27) Concentration of sodium sulfite, mark of plasticity [rating], and color of precipitate (p. 73). (28) Relation between time of extraction and yield of nitrogen and proteid (p. 74). (29-30). Yield of proteid with water or sodium sulfite and 5 or 6 consecutive extractions (p. 76).



(31) Test to maximize yield of proteid using sodium sulphite solvent; the weight of the solution must be 16 times that of the meal, and the yield will be 52.20 (p. 78). (32) Effect of adding acetic acid on yield (p. 79). (32-33) Effect of caustic soda (sodium hydroxide) on percentage of proteid extracted (p. 81) (34-37) Relation between time of extraction and yield of proteid using caustic soda (p. 82-83). (38) Volume of caustic soda consumed by different volumes of bean meal solution (p. 83). (39) Volume of caustic soda solution needed in three extraction processes: water, sodium sulphite, or alkali (p. 85).

(40) Extraction with magnesium sulphate for 1, 2, or 3 hours (p. 90). (41) Percentage of proteids precipitated by different precipitants; "isolated proteid," "glutinizng chemicals" (p. 95) (42). Effects of sulphurous acid, formaldehyde, and formalin (p. 96). (43) Effect of different precipitants on quality of precipitate; "sulphurous acid gives proteid of the whitest and best quality, and most suitable for the manufacture of plastic products" (p. 100). (44) Yields of proteid with different volumes of sulphurous acid; all yields are very unsatisfactory (p. 103). (45-47) Effect of adding sulfur dioxide to sulphurous acid at various concentrations; remarkable increase in yield (p. 104-06). (48-51) Precipitation of water extracted protein using acetic acid (p. 107-10). (52-55) Effect sulphuric acid for precipitation of proteids (p. 111-14). (56-57) Effect heating on yield of proteids (p. 116-17).

Note: Horvath (1937) states: "The extraction of protein from soybean meal, its subsequent precipitation and properties, as well as its industrial applications have been extensively studied by S. Satow, and the results published (in English) in 1921-23 in two voluminous reports [*Technology Reports, Tohoku Imperial University* (Japan): 2(2) and 3(4)]. These reports continue to serve as an unsurpassed source of information on this subject, and a number of discoveries during the last 15 years can be traced to the researches of Satow." Horvath then summarizes many of Satow's key findings. Address: Kôgakuhakushi.

149. Rouest, Leon. 1921. *Le soja et son lait végétal: Applications agricoles et industrielles* [The soybean and its vegetable milk. Agricultural and industrial applications]. Carcassone (Aude), France: Lucie-Grazaille. 157 p. Illust. No index. 25 cm. [42 ref. Fre]

• **Summary:** Contents: Preface, by Louis Forest. Introduction—What is soya? 1. History of the dissemination of soya: In 1712 the naturalist Kaempfer introduced soya, introduction of soya to France and Europe, soya is cultivated in Austria in 1875 by Prof. Haberlandt, soya is the object of many trials in France from 1876 to 1881, the study and acclimatization of soya becomes widespread, the causes of setbacks in the cultivation of soya.

2. Cultivation of soya: Botanical characteristics of soya, the varieties of soya, Chinese varieties and soya in China,

Japanese varieties and soya in Japan, American varieties and soya in America (varieties: Mammoth, Hollybrook, Ito San, Guelph, Haberlandt, Medium Yellow, Wilson, Peking, Tokio, Mandchu [Manchu], Black Eyebrow, Barchet), soya in Europe—France and Italy, seven varieties of soya tested in France, soya in the experimental farms for new crops (*les Fermes Expérimentales de Néoculture*; Many varieties from the USA were tested, including Manchu, Wilson Five, Haberlandt, Tokio, Virginia, Hato [Hahto], Early Medium Green), the cultural and geographical appearance of soya, its production worldwide, planting soybeans, heat units (*degré thermique*) and the germination of soya, the importance of spacing between plants, number of seeds per hectare, soya during its vegetative stage, the vegetation of soya compared with that of the haricot at high altitudes, rolling the seeds and types of crop maintenance, growth of the plant, acclimatization, the enemies of soya.

3. Composition of the soybean plant. 4. Soya forage: Green soya forage, soya hay, soya as a plant for soil improvement. 5. Harvesting soybean seeds: Maturity of the seed, harvesting soya, the food value and composition of soya seeds. 6. Soya as an oil plant: Richness in oil, defatted soybean cake, imports and exports of soya cake from 1915 to 1919 (Imports to: Sweden, Canada, Korea, Japan, Formosa. Exports from: England, China, Korea), production of soya cake from 1915 to 1919 (Denmark, Great Britain and Ireland, Netherlands, Sweden, USA, Japan, Formosa, Korea, Java and Madura).

7. Soymilk: Its manufacture (in 1910-1913 Li Yu-ying installed a factory named "La Caséo-Sojaïne" at Vallées {Asnière-Seine} near Paris. Rouest visited this factory and saw them make soymilk, which was filtered using a filter-press resembling those used in sugar refineries), its properties and composition, composition compared to other types of milk, powdered soymilk, soymilk in the nursing and feeding of animals, soymilk related to tuberculosis in animals and in humans, soymilk would allow the milk and butter from animals to be reserved exclusively for human foods and could be used for raising many piglets, manufacture of non-dairy milk in Canada (a factory is now under construction). 8. Soya in Industry: Soymilk and soy casein, Sojalithe (like Galalithe).

9. Soya in human nutrition: Soy flour and its applications (incl. Li Yu-ying's usine de la Caséo-Sojaïne, and bread made of soya and wheat), soya compared to dry legumes (such as lentils, haricots, peas, beans), soya used as a legume (whole soybeans), the food value of soy sprouts, preserves and confections made from soya, soya chocolate and coffee, the amount of nutrients produced by soya and other crops from a unit of land, a meal of soya served in France (prepared and served some years ago by Li Yu-ying's soyfoods plant La Caséo-Sojaïne for the major print media, the medical press, the National Society for Acclimatization, etc.; it consisted of 2 soups {one with 'soya meat' and one

with soymilk}, 2 entrees {an omelet with smoked soya ham, and fritters stuffed with soy meat}, soy [actually mung bean, *liudou*] sprouts in a salad and sauteed, 3 desserts {soya cake, biscuits, and confection}, and soy coffee; a recipe for each is given; soya meat is smoked tofu.

10. Use of soya in East Asia: Tofu (*fromage végétal*), soy-based condiments (such as natto {Ping ming Natto and Tokio-Natto}, miso, Chinese miso or tao-tjiung [doujiang], and shoyu {Soyou or Schozou}), making soy sauce in Kwantung, China (from Groff).

11. The opinions of several authors concerning soya (from the French medical and hygienic press): Introduction—E. Maurel. Soya and soy bread in diabetic diets—Dr. Dujardin-Beaumetz, Dr. Bloch, Dr. J. Le Goff, L. Beille, M. Gautier. Soya used as a bean—M. Gautier. Soy sauce used in place of meat extracts. The state of cheese. The popularization of soya in Europe—A. Paillieux.

Conclusions: The influence of cultural technology on variation. Appendix: Advice to experimenters on the acclimatization of soya in France. Other methods of obtaining early-maturing soybeans.

The author concludes (p. 140): We must make every effort to acclimatize soya in France. We must develop the will and learn from past mistakes. Most soybean varieties now available in France are too late. We must get varieties from Manchuria, whose climate is similar to that of southeastern France, and from the northeastern USA. It is urgent that, in the near future, we start a Soybean Experiment Station to take responsibility for this work. The setbacks since 1830 can be overcome by present science and genetics. The first step is to introduce better varieties.

On the last page is a full-page advertisement for various seeds sold by Mr. Rouest, including 30 varieties of soybeans (*Soja hispida*); the names of the individual varieties are not given.

Illustrations show: (1) A soy bean plant with many pods (title page). (2) Flowers and pods of the soy bean plant (p. 29). (3) Soy pods and beans (p. 30). (4) A soy bean plant drawn by a Chinese artist (p. 32, from Li Yu-ying). (5) Pods of the Hato [Hahto] variety of soy bean (p. 51). (6) Germinating soy bean seeds (p. 54, from Li Yu-ying). (7) Soy bean roots with nodules (from a photo by Dr. Le Goff; p. 73). (8) Soy bean pods, opened to show 3 beans in each (p. 82).

Tables show: (1) Production of soybeans by color in China in 1916 and 1917 (p. 35, in quintals, from the International Yearbook of Rome, Vol. 1, 1919): In 1917: Yellow 4,069,822. Other 953,012. Green 181,190. White 71,234. Black 40,066. Total: 5,315,324.

(2) Percentage composition of various oilseed cakes (p. 95, from Kellner). (3) Imports and exports of soybean cake, by country, from 1915 to 1919 (in quintals, p. 96). Imports are given for Sweden, Canada, Korea (from 1916), Japan, and Formosa [Taiwan]. Exports are given for England (6

quintals in 1915), China (including Manchuria, by far the biggest exporter, from 1916), and Korea (from 1916).

(4) Production of soybean cakes, by country, from 1915 to 1919 (p. 97, in quintals, based on statistics from the International Bureau of Agriculture, Rome, 1919). In descending order of production in 1915 (in quintals): Japan 5,439,337. Korea 3,209,238. Great Britain and Ireland: 1,513,059. Denmark 921,782. Java and Madura 503,025. Note that China is not listed. Netherlands 144,523. Formosa [Taiwan] 62,131. Sweden 1,733. USA 0, but 501,822 in 1916.

Note: When Alsace was occupied by the Germans during World War I, the Rouest family moved from Alsace to Paris. Mr. Rouest brought soybeans from Africa and adapted them to France. He paid for the publication of this book. Address: Directeur des Fermes Expérimentales de Néoculture, Carcassonne (Aude), France.

150. Rouest, Leon. 1921. *Le soja et son lait végétal: Applications agricoles et industrielles* [The soybean and its vegetable milk. Agricultural and industrial applications]. Carcassonne (Aude), France: Lucie-Grazaille. 157 p. Illust. No index. 25 cm. [42 ref. Fre]

• **Summary:** This is a summary of interesting points throughout this book. The main early use of soy in Europe was more therapeutic than nutritional (p. 3); it was used mainly in diabetic diets.

Nothing remains of the early trials conducted 20 years ago in France and Austria. The reasons for the crop's failure were lack of understanding of the laws of acclimatization and genetics, and the fact that soya (*soja*) was introduced as a new food legume, when actually it can only be utilized as a forage plant and industrially (for oil, cakes, and casein). Later, when the plant has been adapted, when it is understood that soya is not being propagated to compete with other dry legumes, that it is not being cultivated to extract from the seeds a vegetable milk for people, but simply as a forage plant—and the most remarkable one that exists (p. 3).

The English are trying to acclimatize soya to their colonies, especially those in southern Africa. In 1908 some 200,000 tonnes (metric tons) of soybeans were exported from China [including Manchuria] to Europe, followed by 500,000 tonnes in 1909. One can extract from soybean seeds a vegetable milk (*lait végétal*) which has the same value as animal milk for use in raising young animals. Its seeds and forage are also fine for raising farm animals and for industrial products. The author thanks all those who have helped him to acclimatize the soybean to France and to create new varieties of soya in France (p. 4).

Introduction of the soybean to France and to Europe (p. 6-7): A good but brief review of the literature on this subject. In 1739 Buffon was made director of the Jardin des Plantes in Paris. Shortly thereafter, Christian missionaries in China sent him specimens of seeds and plants. The soybean must

have been among them. The soybean has very probably been cultivated at the Museum since 1779, certainly in 1779 and later from 1834 to 1880. In 1855 Baron de Montigny was charged by the Society for Acclimatization to distribute five varieties of soya sent from China by Mr. Montigny; these were from northern China. The plants first bore seeds in France in 1854; their acclimatization is assured. In 1857 Mr. Lachaume transmitted to the Society for Acclimatization details of the success he obtained at Vitry-sur-Seine with soy culture. The seeds were planted in 1856. In 1858 a report to the Society for Acclimatization indicated that the acclimatization of the soybean was complete. In 1859 Mr. de Vilmorin reported on cultural trials sent from China by Mr. Perny. The varieties matured too late. The same year Dr. Turrel harvested soybeans at Toulon. In 1862 the Society for Acclimatization received seeds from Mr. Guillemin; the yellow soybean was said to be used for making tofu. Following the events of 1870, the cultivation of the soybean in France was apparently discontinued. Note: The brief war of 1870 between France and Bismark's Germany ended in France's defeat and the ceding to Germany of Alsace-Lorraine.

In the long section on Prof. Haberlandt's work with soya, starting with his cultivation of it there in 1875, is a quotation from him: "I don't know, in this history of cultivation, any example of a plant which has, in so few years and to such a high degree, excited such general interest" (p. 8).

From 1876 to 1881, the soybean was the object of numerous trials in France by the Society of Horticulture at Etampes (Seine-et-Oise). During this same period, one Dr. H. failed with varieties sent from Japan but succeeded in cultivating a yellow soybean sent from China, and used the latter to make his own tofu (*fromage végétal*) for use at home. In 1880 Messrs. Vilmorin-Andrieux introduced in their catalog a species grown in Austria-Hungary (p. 17-18).

In 1878, Japan, China, and the Indies (*les Indes*) presented all the varieties of Soya at the Universal Exposition, and their seeds filled more than 20 boxes. In 1880 the National Society for Acclimatization was able to distribute soy in France and tests were conducted in 24 regions; they were largely successful, especially in central and southern France (p. 19-22).

Tests were then abandoned from this time until about 1888, when the soybean started to grow in the southern states of the USA. That same year Messrs. Lecerf and Dujardin-Beaumetz first had the idea of using soy bread in diabetic diets (p. 22).

Causes of setbacks in soybean culture (p. 24-27): First, the varieties used matured too late and were not acclimatized in a progressive manner. We must choose varieties from northern China and adapt them to the south of France (*le Midi*) [which is on the same latitude as Toronto, central Wisconsin, or southern Minnesota]. From these, we must

develop hybrids, and gradually move them northward.

The soybean has been ostracized in France. Major commercial, financial, and social interests have viewed with terror the production of an inexpensive food and have retreated into the egotistical "Malthusian agriculture." This is the truth!

Soy cheese is even feared by the cheese industry in France. They ask if they should abandon their excellent cheeses in order to adopt a vegetal cheese (*fromage végétal*).

A long quotation from the *Chinese Imperial Encyclopedia of Agriculture* gives the various colors of soybeans, including black, white, grey, and even some speckled / mottled with blue. The black ones can be used for medicine. And they are used as an ingredient in the condiment called fermented black soybeans (*Chi [douchi]*), made of soybeans, ginger, and salt.

In 1910-1913 a factory named "La Caséo-Sojaïne" was installed near Paris. I (Rouest) visited this factory in which were installed all the modern conveniences (*tout le confort moderne*), and presented the best guarantees of hygiene. The milk was filtered using a filter press similar to those used in sugar factories (p. 99).

Note: Rouest has borrowed a great deal of material from earlier publications by Li Yu-ying, usually without acknowledgment and often arriving at very different conclusions, especially on the question of using soya to make human foods (Li) vs. foods and milk for animals (Rouest).

Rouest strongly recommends the use of soymilk to feed young domesticated animals. For us, soy will not replace green beans, milk or cheese. During World War I, the Germans were actively involved with the study of soymilk. A translation of an article from the *Schweizerische Milchzeitung* (Nov. 1918) tells how to make soymilk and tofu (p. 102). By using soymilk, there is no fear of transmitting tuberculosis. Address: Directeur des Fermes Expérimentales de Néoculture, Carcassonne (Aude), France.

151. Thurston, Azor. 1922. Pharmaceutical and food analysis: A manual of standard methods for the analysis of oils, fats and waxes, and substances in which they exist; together with allied products. New York, NY: D. Van Nostrand Co. xiii + 416 p. Index. 24 cm. [14 soy ref]  
 • **Summary:** A table titled "Non-official oils" (p. 159-60) lists 16 such oils and for each gives its chief components, specific gravity at 25°C, refractive index at 20°C, iodine value, saponification value, and uses. An "official oil" is one described by the U.S. Pharmacopeia or the National Formulary. Almond oil and sesame oil are official oils; peanut oil and soya bean oil are not. For soya bean oil (from *Soja hispida*) the chief components are oleic, linolic, stearic and palmitic acids. Used for edible purposes, soap and paint manufacturing. In Chapter 5, titled "Oils, fats and waxes" is a long section titled "Soya bean oil" (p. 173-75). Contents: Various names: Soja bean oil, soy-bean oil. It is a fixed oil,

not a volatile oil. U.S. imports of soya bean oil from 1918 to 1920. U.S. production of soya bean oil in 1919. Constants. Principal components. Preparation and yield. Properties and tests. Uses (Soap making, paints and varnishes, waterproof clothing. Edible oil in the manufacture of lard substitutes and oleomargarine. Used to a limited extent as a lubricant and burning oil. "German Coffee Berry" is a variety of soya bean, the seed of which, being parched and ground, is used like coffee). By-products (Soya bean meal is a valuable stock food). Natto (based on Muramatsu 1912). Soya bean chocolate (based on Li 1911).

A table (p. 259) shows that dried soya beans contain anti-beri-beri, anti-xerophthalmia, and anti-scurvy vitamins.

Also discusses: Hydrogenation and hydrogenized oils (p. 60-63). *Oleum amygdalae expressum* (Expressed olive oil; p. 86-88). Adulteration of olive oil (p. 110; In the USA it is largely adulterated with cottonseed oil; sesame oil, sunflower oil, corn oil, peanut oil, and minerals are occasionally used. The constants of arachis oil and olive oil are nearly the same). *Oleum sesami* (Gingili oil, teal oil, benne oil; p. 118-21). Peanut oil / arachis oil and peanut butter (p. 159, 168-73). Oleomargarine (p. 252-60; incl. nut margarines and "vitamines"). Azor Thurston lived 1861-1922. Address: Late Chemist to the Ohio State Pure Food and Drug Commission.

152. Piper, Charles V.; Morse, William J. 1923. *The soybean*. New York, NY: McGraw-Hill Book Company, Inc. xv + 329 p. Feb. Illust. Index. 24 cm. Reprinted unrevised in 1943 by Peter Smith Publishers, New York. [563 ref]

• **Summary:** This is the first comprehensive book about the soybean written in English, and the most important book on soybeans and soyfoods written in its time. Contains an excellent review of the world literature on soybeans and soyfoods with a bibliography on soy that is larger than any published prior to that time (563 references), a good description of the present status of the soybean worldwide based on the authors' extensive contacts, and a great deal of original information. It quickly became a key source for people and organizations working with soybeans and soyfoods in all countries, and a major factor in the expansion of the soybean in the western world. Because of its scope and influence, Soyfoods Center considers the year of its publication to mark the end of the "Early Years" of the soybean worldwide. It remained in print until about 1986.

Contents: Preface. 1. Introduction: Name of the plant, origin, literature, use by the Chinese and Japanese, present importance, future prospects in the U.S., recognition of the possibilities. 2. The commercial status of the soybean: Manchuria and China, Japan, Europe, U.S., other countries, summary of imports and exports of soybeans and soybean oil. 3. Botanical history of the soybean: History prior to Linnaeus' "Species Plantarum" 1753, Linnaeus' misunderstandings of the soybean, Prain's elucidation, other and the correct botanical name.

4. Agricultural history of the soybean: Vernacular names of the soybean, China, Korea, and Japan, India and neighboring regions, Cochin China, Malayan region, early introduction into the United States, later U.S. introductions, the early introduced varieties (grown in the USA by 1898—Ito San, Mammoth, Buckshot, Guelph or Medium Green, Butterball, Kingston, Samarow, Eda, Ogemaw or Ogema), soybean in Europe, varieties grown in Europe and identification, Hawaiian Islands, Australia, Africa, Argentina (p. 50), Canada ("Soybeans are grown in very small quantities in Canada and then usually as a forage crop"), Philippines, Egypt, Cuba (p. 52), British Guiana, Mauritius (p. 53), present culture distribution. 5. Culture of the soybean: Climatic adaptations, soil preferences, water requirement, preparation of seed bed, time of planting, methods and rate of seeding, seeding for pasturage, depth of seeding, inoculation, fertilizer reactions, cultivation, soybeans in mixtures (with cowpeas, sorghums, Sudan grass, Johnson grass, millet, corn, or sunflowers and corn).

6. Harvesting and storage of soybeans: harvesting soybeans for hay, silage, for the seed, seed yields, proportion of straw to seed, storing seed, separation of cracked from whole soybean seed, viability of soybean seed, pedigreed, inspected, registered, and certified seed. 7. Composition of the soybean: Proportions of stems, leaves and pods, composition of plant and seed, nutritive and mineral constituents, forms of nitrogen in soybean nodules, factors affecting oil content of seed. 8. Utilization of the soybean: Diversity of uses (a chart, p. 129, shows 59 products that can be made from soybean seeds, and 6 more that can be made from soybean plants), soybeans for green manure, pasturage, soiling, ensilage, hay, straw.

9. Varieties: Japanese, Manchurian, botanical classifications, vital characteristics, descriptions of important varieties, key for identification, breeding and improvement, genetic behavior, oil content.

10. Structure of soybean seeds. 11. Soybean oil: Methods of extraction [Manchurian, and solvent], American oil mills, methods of shipping and marketing, prices, utilization in soap manufacture, food, paint manufacture, miscellaneous. 12. Soybean cake or meal: Feeding value, composition, use for feeding for dairy cows, cattle, swine, sheep, poultry, digestibility, injurious effects, fertilizer.

13. Soybean products for human food: Food value of the soybean, digestibility of the soybean and its products, mature or dry soybeans, immature or green soybeans (a "nutritious green vegetable"), soybean flour, digestibility of soybean flour, soybean bran (p. 225-26), soybean sprouts, soybean coffee, soybean or vegetable milk [soymilk] (preparation, composition, residue from the manufacture of vegetable milk [okara], utilization of soybean milk, condensed vegetable milk, vegetable milk powder, fermented vegetable milk), vegetable casein, tofu or soybean curd (names and brief history, method of manufacture, coagulating agents,

manufacturing yields, digestibility, utilization of bean curd and manufactured products, bean curd brains or *tofu nao*, dry bean curd or *tofu khan*, thousand folds {*chien chang tofu*}, fried bean curd {*tza tofu*}, Fragrant dry bean curd {*hsiang khan*}, frozen tofu {*kori tofu*}, Chinese preparation, various dishes), natto, hamananatto [hamanatto], yuba, miso, shoyu [soy sauce], confections. 14. Table dishes of soybeans and soybean products: mature or dry beans, flour, tofu, sprouts (86 recipes). 15. Enemies of the soybean: bacterial, mosaic, fungous [fungus], and nematode diseases, insects, rodents. This last chapter is a comprehensive review of the literature on soybean diseases and insects published before 1922.

The Preface begins: "The soybean, also known as soya or soja bean, has assumed great importance in recent years and offers far-reaching possibilities of the future, particularly in the United States. It is, therefore, desirable to bring together in a single volume the accumulated information concerning this crop..."

"The aim has been to present the information so as to make it useful from both agricultural and commercial standpoints, not omitting, however, much that is mainly of historical or botanical interest..."

The introduction begins: "There is a wide and growing belief that the soybean is destined to become one of the leading farm crops in the United States."

Note 1. C.V. Piper lived 1867-1926. Note 2. This is the earliest English-language document seen (July 2003) that uses the term "soybean bran" to refer to soy bran.

Note 3. This is the earliest document seen (July 2003) in which Piper or Morse describe natto, Hamananatto [Hamanatto], yuba, or miso.

Note 4. This book was published by March 1923 (See *Ohio Farmer*, 10 March 1923, p. 313). Address: 1. Agrostologist; 2. Agronomist. Both: United States Dep. of Agriculture, Washington, DC.

153. Piper, Charles V.; Morse, William J. 1923. Natto (Document part). In: Piper and Morse. 1923. *The Soybean*. New York: McGraw-Hill. xv + 329 p. See p. 244-45. [1 ref]  
**• Summary:** "Natto, a sort of vegetable cheese prepared from soybeans, has long been used by the Buddhists and is now used extensively by the Japanese. Although it is made throughout Japan, the method of manufacture varies somewhat with the locality, the different kinds being associated with the place of manufacture such as Tokyo natto, Kyoto natto, etc.

"In preparing natto, the soybeans are boiled in water for about five hours to render them exceedingly soft. The material while still hot, is wrapped in small portions (about a handful) in rice straw and the bundles tied at both ends (Fig. 70) are placed in a cellar or room (Fig. 71) heated by hot water or charcoal. The room is then closed for about 24 hours, the temperature ranging from 35 to 40°C., this allowing the cooked beans to ferment in the warm, moist

atmosphere.

"Another method is to put the cooked beans in a box with cut straw placed over and closed with a lid. The box is then placed in a stove for 24 hours at a temperature of 35 to 40°C. The fermented product is a thick viscid mass having a peculiar but not offensive odor. The amount of natto produced is about double the quantity of beans used.

"Although the moderate heat of the cellar or rooms acts for only 24 hours, there is evidently a considerable bacterial fermentation. Yabe (1897) [sic, 1894 or 1895] made a rather extensive study of the microorganisms and chemical composition of natto. This investigator found one species of bacillus and three of micrococcus present..."

"In addition to being a highly nutritious food, it is quite probable that Natto is more easily digested than the soybean, as it is very soft and contains more peptone. The average composition of natto is as follows: Water, 61.84%; albumen, 19.26; fat, 8.17; carbohydrates, 6.09; cellulose, 2.80; ash, 1.84.

"Natto is used commonly as a side dish and also as a material for confections. It is usually eaten with drops of soy sauce.

A table (p. 245, based on Yabe 1894) compares the nitrogenous substances in soybeans and natto made from those same soybeans. Unfortunately the table was reproduced incorrectly so that most of the values are wrong. For the correct values see Yabe 1894, "On the vegetable cheese, natto."

Photos show (p. 243): (1) About ten Japanese women and men sitting on bundles of straw in a room, "packing a handful of boiled soybeans into fresh rice straw wrappers in preparation of natto." (2) Two Japanese men in a brick-walled natto fermenting room. One is looking in through the small, low entrance door. Each holds a bundle of the straw wrappers.

Note: This is the earliest document seen in which Piper or Morse describe natto.

154. Piper, Charles V.; Morse, William J. 1923. Tables (Document part). In: Piper and Morse. 1923. *The Soybean*. New York: McGraw-Hill. xv + 329 p.

**• Summary:** Tables: (1) Acreage, production and yield of soybean seeds in the United States. Gives statistics for each for 1918, 1919, and 1920 for 14 states, other, and total. The states are listed in descending order of soybean acreage in 1921, as follows: North Carolina, Virginia, Alabama, Illinois, Ohio, Kentucky, Missouri, Tennessee, Wisconsin, Indiana, Georgia, Pennsylvania, S. Carolina, Mississippi.

(2) Estimates of soybean production of Manchuria for various years (in million tons): 1906 = 0.6. 1907 = 0.6 to 0.9. 1908 = 1.150. 1909 = 1.150. 1910 = 1.4. 1913 = 1.2 1921 = 4.52.

(3) Cost of production of soybeans per acre in Manchuria, 1910. (4) Monthly capacity of steam oil mills at

- Newchwang, Manchuria, 1917. (5) Export of soybeans, bean cake, and bean oil from the principal ports of South Manchuria, 1909 to 1913, inclusive. (6) Five-year averages of acreage, production, and yield per acre of soybeans in Japan. (7) Amount and value of soybeans imported by Japan. (8) Importations of soybean cake and bean oil into Japan. (9) Quantity and value of exports of soybeans and soybean oil from Japan to foreign countries, 1913 and 1914. (10) Quantity and value of exports of miso (bean cheese) and shoyu sauce, 1903 to 1907, inclusive. (11) Quantity and value of imports of soybeans, bean cake, and bean oil by European countries, 1912 to 1914, inclusive. (12) Comparative prices per ton of cottonseed and soybeans in European markets, 1911 to 1914, inclusive. (13) Quantity and value of soybeans, soybean cake, and soybean oil imported into the United States, 1910 to 1920, inclusive. (14) Quantity of imports of soybeans in the world's trade, 1920-1919 inclusive. (15) Quantity of imports of soybean oil in the world's trade, 1910-1919 inclusive. (16) Quantity of exports of soybean oil in the world's trade, 1910-1919 inclusive. (17) Quantity of exports of soybeans in the world's trade 1910-1919 inclusive. (18) Acre yields of seed and hay of soybeans at different dates of planting at Arlington Farm, Virginia. (19) Yields of soybeans variously spaced. (20) Acre yields of soybean hay and seed when planted at different rates. (21) Germination of soybeans at different depths of planting at Arlington Farm, Virginia. (22) Influence of nodules on the composition of seed. Michigan Experiment Station. (23) Effect of various nitrogenous fertilizers on the yield of soybeans. Massachusetts Experiment Station. (24) Effects of different phosphatic fertilizers with and without lime. Rhode Island Experiment Station. (25) The influence of different potash salts on yields of soybeans. Massachusetts Experiment Station. (26) Effects of different kinds of lime on the yield of soybeans. Massachusetts Experiment Station. (27) Effect of fertilizers on soybeans. Delaware Experiment Station. (28) Composition of hay of Mammoth soybean at different stages of development. Arlington Farm, Virginia. (29) Comparison of the loss in moisture in 10-lb. samples of green forage of ten varieties of soybeans when air dried. Arlington Farm, Virginia. (30) Tons of soybean hay to the acre at different experiment stations in the United States. (31) Bushels of soybean seed to the acre at different experiment stations in the United States. (32) Relative yields of straw to seed in different varieties of soybeans. Ohio Experiment Station. (33) Viability of soybean seed. (34) Proportions of stems, leaves, and pods. (35) Nutritive constituents contained in each part of the soybean plant. After Lechartier. (36) Composition of the different parts of the soybean plant at different stages of growth, at Arlington Farm, Virginia. (37) Total weights of mineral materials in 1,000 kilos of dry forage. After Lechartier. (38) Mineral Materials in 1,000 kilos of dry forage. After Joulie. (39) Percentages of nitrogen, phosphoric acid and potash contained in different parts of the soybean plant at different stages of growth, at Arlington Farm, Virginia. (40) Composition of soybean seed compared with that of other legumes. (41) Composition of common American varieties of soybeans. (42) Percentage composition of the different parts of soybean seed. After Lechartier. (43) Percentage composition and comparison of the amino acids of the protein of the soybean and of cow's milk. (44) Percentage composition of the nitrogen-free extracts of the soybean. (45) Starch content of commercial varieties of soybeans in the United States. (46) Maximum, minimum, and average of the more important constants of soybean oil from 48 varieties, compared with those of other well-known oils. (47) Comparison of the more important constants of soybean oil by different observers. (48) Constants for soybean oil. (49) Composition of the ash of the soybean seed. After Pellet. (50) Mineral content of the soybean seed compared with those of cowpea, navy bean, and peanut. (51) Oil content of soybeans gathered at various stages of maturity. (52) Oil content of soybeans as affected by partial defoliation. (53) Oil content of soybeans as affected by partial removal of very young seed pods. (54) Oil content of soybeans of large and small size seed from the same plant. (55) Oil content of soybeans planted at intervals of two weeks in 1911, at Arlington Farm, Virginia. (56) Varietal differences in the oil content of soybeans grown at Arlington Experiment Farm, Virginia, in 1907, 1908 and 1910. (57) Oil content of soybeans grown under different environmental conditions. (58) Oil and protein content of soybean varieties grown under different environmental conditions. (59) Fertilizing constituents of soybeans contained in crop and roots on one acre. Connecticut (Storrs) Experiment Station. (60) Yields of hay of different legumes and content of fertilizing ingredients. Michigan Experiment Station. (61) Fertilizing constituents of soybeans cut at different stages of growth. Arlington Farm, Virginia. (62) Data and results of soiling experiments with milch cows. Iowa Experiment Station. (63) Soybean soiling experiment with milch cows, Pennsylvania Experiment Station. (64) Analyses of soybean, soybean and corn, and corn silages. (65) Digestibilities of soybean and other silages. (66) Digestible nutrients in 100 lb. of air-dry substance. (67) Digestible nutrients in 100 lb. of soybean straw and in other roughages. (68) Fertilizing constituents of soybean straw compared with those of wheat, oats, barley, and rye. (69) Number of seeds per bushel and weight in grams of 100 seeds of the most important varieties. (70) Results of planting a single variety of soybean at different dates. Vienna, Austria, 1877. (71) Results of planting different varieties of soybeans at different dates at Knoxville, Tennessee. (72) Life period of soybean varieties grown at the Arlington Experimental Farm, Virginia, for eight seasons. (73) Life periods of American varieties of soybeans grown at Sabour, India, 1911 (from Woodhouse and Taylor, 1913). (74) Life period of soybean varieties planted at intervals of

two weeks in 1911 at the Arlington Experimental Farm, Virginia. (75) Behavior of flower color in natural hybrids. (76) Behavior of pubescence colors in natural hybrids. (77) Behavior of amount and colors of pubescence in an artificial hybrid. (78) Behavior of the color of pods in natural hybrids. (79) Behavior of seed colors in natural hybrids. (80) Soybean crosses in the study of seed color. (81) Behavior of cotyledons in natural hybrid selections. (82) Behavior of cotyledons in soybean crosses. (83) Variations in the cooking qualities of seed of different varieties of soybeans. (84) Consumption of vegetable oils by the soap industry in the United States. (85) Consumption of vegetable oils in the production of lard substitutes and oleomargarine in the United States. (86) Composition of soybean cake, meal, and other important oil feeds. (87) Two 17-week comparisons of soybean meal with other supplements for fattening pigs. (88) Growth and nitrogen elimination of chicks fed varying amounts of meat scrap or soybean meal or both, in addition to a corn ration. (Indiana Experiment Station). (89) Comparison of the digestibility of soybean meal and other oil meals. (90) Digestion coefficients of soybean meal obtained with sheep. Massachusetts Experiment Station. (91) Fertilizing constituents of soybeans, soybean meal, and cottonseed meal. (92) Analyses and calories of soybeans compared with those of other legumes and foods. (93) Composition of soybean flour in comparison with wheat flour, corn meal, rye flour, graham flour, and whole wheat flour. (94) Composition of the sprouts from the soybean and mung bean. (95) Composition of soybean milk compared with cow's milk. (96) Yields of bean curd obtained from different varieties of soybeans. (97) Compositions of tofu and tofu products. (98) Nitrogenous substances in natto. (99) Composition of hamananatto. After Sawa. (100) Composition of yuba. (101) Composition of red and white miso. (102) Composition of shoyu or soy sauce. (103) Composition of soybeans of the same variety dried, soaked, and roasted.

155. Church, Margaret B. 1923. Soy and related fermentations. *USDA Department Bulletin* No. 1152. 26 p. May 12. [27 ref]

• **Summary:** This long and very informative paper, with its excellent bibliography and review of the literature, is the third earliest study seen of a fermented food published by a USDA researcher. The focus is on Japanese fermentations because of the laboratory's contact with Japanese researchers, such as Dr. T. Takahashi and Dr. G. Kita. "The experimental work reported here was conducted under the direction of Charles Thom, mycologist in charge, Microbiological Laboratory, Bureau of Chemistry."

Contents: Introduction. Work of previous investigators. Experimental work: Apparatus, material, preparation of ingredients, shoyu-koji, peanut press cake koji, shoyu-moromi. Proportions of ingredients. Yields. Chinese soy

sauce. Peanut sauce. Relation of enzymic activity to soy processes. Manufacture in the United States. Related fermentations (Miso, soy cheese [fermented tofu], natto). Summary. Bibliography. "Soy sauce is a dark-brown salty liquid made by the fermentation of soy beans with, as a rule, some additional starchy component. It is widely used as a seasoning throughout Japan, China, and Java [Indonesia], and has been introduced into the Philippines and Hawaii\* (\* = See letter from C.W. Carpenter, Sept. 23, 1918). Where the occidental would use a vegetable or meat extract and salt, the oriental daily uses soy sauce. Americans are familiar with soy sauce as it is used in the Chinese-American restaurants and as an ingredient which produces the characteristic flavor of the Worcestershire type of sauce." In Japan, the process of preparing "shoyu-koji," a mold-fermented product made from "tane-koji," takes 3 to 4 days. "The mold-fermented material is emptied into a strong brine, thus producing a mash. Constant daily attention is given to aeration, even distribution, and stirring of the solid ingredients. Progressive changes take place over a period of from six months to several years, until at last the mature 'moromi,' as the mash is designated by the Japanese, is produced. These changes are due partially to the activity of bacteria and yeasts, but chiefly to the enzymes of the mold introduced into the mash with the koji."

"Experimental work: The Department of Agriculture had certain strains of the *Aspergillus flavus-oryzae* group of molds known to be used in making soy sauce. Through the courtesy of W.T. Swingle, of the Bureau of Plant Industry, a can of commercial Japanese rice *tane-koji* designed for shoyu manufacture was also received. Dr. Gen-itsu Kita brought additional samples of shoyu *tane-koji* under sterile conditions directly from Japan. Provided thus with soy beans, wheat, and the mold ferment, experiments with soy sauce were undertaken by the Bureau of Chemistry in 1918.

(1) "Apparatus: The apparatus was made according to specifications drawn by Doctor [T.] Takahashi, of the Imperial University of Tokyo, who worked in the bureau for a month." "The usual Japanese koji room (fig. 2) is 32½ feet long, 11 feet wide, and 7 feet high. The walls are thick, and in the more modern factories are built of brick, which does away with fluctuations in the temperature from without. At one end of the room is an entrance and at the opposite end a window. In the ceiling several openings provide means of escape for the carbon dioxid [dioxide] and the damp air. Steam pipes along the floor make it possible to warm the room in cold weather. The ceiling is built with many layers of straw in order that the condensing moisture may be absorbed. One disadvantage of such a ceiling is that infection always occurs in the wet straw. A large area of infection directly over the piles of koji trays is detrimental to the production of sweet koji. In modern buildings, therefore, the surface of the ceiling is coated with cement. When a cement ceiling is used the condensed water drops on the trays of

koji, which also is harmful... The burning of sulphur is useful in combatting any infection of a koji room.”

Material: “The mold ferment employed in shoyu-koji manufacture is *Aspergillus flavus* Link, occasionally *A. oryzae* (Ahlb.) Cohn, or strains intermediate between the two species.” “Certain Japanese manufacturers add cultures of pure yeast belonging to the genus *Zygosaccharomyces* at the time of placing the first mold-fermented material in the brine.”

Preparation of ingredients: While soaking the soy beans, the water should be changed at intervals of several hours to prevent the formation of spore-forming rods, which cause heating and souring. The spores of these bacilli are on the beans as they come from the field. “After being soaked for 20 to 24 hours the swollen beans are cooked in an open kettle or under pressure until they are soft enough to be easily pressed flat between the thumb and finger. This desired softness can be obtained by autoclaving at 15 pounds pressure for 50 minutes and also by much longer cooking in an open kettle. Autoclaving under pressure has the advantage of sterilizing the material.” After roasting, the wheat is crushed or cracked. It is important to “reduce some portions of the kernel to a fine powder or dust.” The cooked beans and cracked wheat are “mixed in large trays or on mixing tables.” Hot beans “may be cooled with a draft of air directed over a thinly spread layer.” These “two ingredients need to be thoroughly mixed, so that the wheat dust may form a coat over each bean. The lower water content thus induced on the exterior of the beans makes them better adapted to mold growth than to bacterial growth.”

“Shoyu-koji–Ripening: After the beans and wheat are thoroughly mixed, a very small quantity of previously molded material, such as mature rice koji (tane-koji), some shoyu-koji, or a pure mold culture, is thoroughly mixed into the ingredients. The whole mass is then distributed into the small flat koji trays (Plate II, inserted between pages 4 and 5) which are immediately placed into the koji fermentation room before they cool further. Each tray holds about 1.8 liters, or about 2 quarts of raw material. The koji trays are placed in tiers along the wall of the room (Fig. 3).” They are usually stacked in a zigzag fashion to ensure adequate aeration. This is extremely important “because moisture and the lack of oxygen induce the development of mucors and bacteria, and are said to cause the diastatic enzyme to develop at the expense of the proteolytic enzyme. In some localities in Japan no such trays are used, but a broad straw mat with which very good koji can be secured.” “The koji room or compartment is kept at a temperature of 24° to 25° C., with a definite humidity.” Continued. Address: Microanalyst, Microbiological Lab., Bureau of Chemistry [USDA].

156. Church, Margaret B. 1923. Soy and related fermentations (Continued–Document part III). *USDA*

*Department Bulletin* No. 1152. 26 p. May 12. [27 ref]

• **Summary:** Continued (p. 20): Relation of enzymic activity to soy processes: During the ripening of the moromi, the essential factors are diastatic and proteolytic enzymes produced by the mold. But what part do the enzymes of the bacteria play? “Increasingly great numbers of bacteria in the koji cause an undesirable flavor in the final soy sauce.”

Manufacture [of soy sauce] in the United States: Making soy sauce is a complex, subtle, and difficult process. “If this were not true the process would not be regarded as secret, as it so generally is in the Orient.” Church was interested in helping a soy sauce industry to develop in the USA. “The majority of soy sauce makers and manufacturers in the Orient employ purely rule-of-thumb methods which have been handed down and individually perfected by more or less successful experience. Accurate knowledge of the reasons for the steps involved in the process as practiced is not common.”

“Of the almost innumerable ways in which soybeans are used in the Orient as more or less elaborately prepared foods, soy sauce seems to offer prospects of more immediate adoption in the United States than any other product...”

“Soy sauce has already gained a strong foothold with frequenters of Chinese-American restaurants.

“Table sauces containing soy sauce as an ingredient are to be had in a great variety of grades and flavors. They also present an unlimited field for further variation. Concentrated forms of seasoning, such as yeast and vegetable extracts suitable as meat substitutes in flavoring soups and other prepared dishes, are receiving consideration by manufacturers.”

“The manufacturers of table sauces and condiments interested in soy sauce are among the largest and best known firms of the United States... One company at least in the United States manufactures a wholly domestic product.”

Related fermentations (Miso, soy cheese [fermented tofu], natto). Summary. Bibliography. Address: Microanalyst, Microbiological Lab., Bureau of Chemistry [USDA].

157. Oshima, Kokichi. 1923. Kôji-kin nado no denpun tôka kôso oyobi tanpakushitsu bunkai kôso no teiryô-teki sokutei-hô [A quantitative method for determining the starch saccharifying enzymes and proteolytic enzymes of koji mold]. *Sapporo Norin Gakkaiho (J. of the Society of Agriculture and Forestry, Sapporo)* 14(63):373-92. May. [Jap]  
Address: Hokkaido Daigaku Suisan Senmon-bu Kagaku Kyoshitsu, Japan.

158. Hotta, Imakazu. 1923. Kôji-kin no baiyô kyôgû ni yoru jidai naiteki henka ni tsuite [The inner change of next generation of koji mold by cultural condition]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 1(2):96-99. Sept. [Jap]  
Address: Marukin Shoyu K.K., Moto Gishi-cho, Japan.



159. Oshima, Kokichi. 1923. Kôji-kin nado no denpun tôkaso oyobi tanpakushitsu bunkai kôso no teiryô-teki sokutei-hô [A quantitative estimation of starch saccharifying enzyme and proteolytic enzyme of koji mold]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 1(3):204-18. Oct. [Jap]  
Address: Hokkaido Teikoku Daigaku, Jokyôju, Japan.

160. Oshima, Kokichi. 1923. Kôji-kin nado no denpun tôka kôso oyobi tanpakushitsu bunkai kôso ryoku no teiryô-hô [A method for determining the starch saccharifying enzyme and proteolytic enzyme activity of koji mold]. *Kogyo Kagaku Zasshi (J. of the Chemical Society of Japan, Industrial Chemistry Section)* 26:685-98. [Jap]  
Address: Hokkaido Daigaku Suisan Senmon-bu, Kagaku Kyoshitsu, Nôgaku-shi.

161. Bergey, David H.; Harrison, F.C.; Breed, R.S.; Hammer, B.W.; Huntoon, F.M. 1923. Bergey's manual of determinative bacteriology: A key for the identification of organisms of the class schizomycetes 1st ed. Baltimore, Maryland: The Williams & Wilkins Company. xxii + 461 p. See p. 278-79. 2nd ed. 1925. [1 ref]  
• **Summary:** *Bacillus subtilis* is described on pages 278-79. No mention is made of natto; moreover *Bacillus natto*, the natto bacterium, is not mentioned.

162. Bottari, Fulvio. 1923. La soja nella storia, nell'agricoltura e nelle applicazioni alimentari ed industriali [The soybean in history, in agriculture, and in food and industrial applications]. Torino & Genova, Italy: S. Lattes & Co. 243 p. Preface by Prof. Oreste Matriolo (R. Università di Torino). With 34 illust. 22 cm. [25 ref. Ita]  
• **Summary:** Contents: Preface. Reason for the work; its scope and limits. Part I: The origin and history of the soybean. Reason for this history, the origin of the soybean and its early dissemination, soya (including production statistics) in Oriental countries (China, Manchuria, Japan, Formosa, Korea, French Indochina), how the soybean was introduced to Europe, the cultivation of soya in France, Soya in England, Austria, Germany, Denmark, Holland, Russia, Sweden, Alsace-Lorraine (now in northeast France), Spain, Italy, America, Conclusion.

Part II: Cultivation of soya. Part III: Soya in the feeding and nutrition of humans and animals. 1. The analysis and physiology of metabolism as an element in the study of nutrition. 2. Soybean forage in the feeding of animals. 3. Soybeans (*il grano di soja*) and soy products in the feeding of humans and animals. 4. Flour, pasta, and bread in feeding. 5. Soymilk (*il latte di soja*) and its use in the feeding of animals and humans. 6. Tofu (*il formaggio di soja*). 7. Soy oil and oil-cakes (*panelli*). 8. Condiments and sauces: Natto, miso, soy sauce. 9. Enzymes (I fermenti, incl. urease). 10. Conclusions.

Part IV: Industrial applications of soya.

Part V: General conclusions.

The first test of the lactation of calves with soymilk was conducted in the winter of 1916-17 by the Bonafous Institute in Turin. The results were splendid, and have encouraged eminent pediatricians such as Dr. Casalini, Prof. Dr. Alberto Muggia (teacher of clinical pediatrics at the University of Turin), and Dr. Enrico Gasca (vice director general of infants at Turin) to extend their experiments (p. 6).

In Italy vegetable oil production has decreased steadily from 1870 to 1920. Attempts were made to grow sesame, peanuts, and rapeseed, and to import oils from abroad. During World War I, unrefined soy oil was introduced to the market in large quantities, but its unappealing taste disgusted consumers and for a while nothing more was heard of it. Then in 1921 it began to be introduced again, but this time it was refined at Italy's national oil works. The good results obtained encouraged the Italian oil milling company, Sairo, and other oil works to make great progress in soy oil production. Several thousand quintals (i.e. several hundred metric tons) of the best soy oil, sold under the name "refined oil from seeds," were introduced in the first half of 1922 by the national oil works of Genoa.

Returning to the early history of soya in Italy, we find that in 1848 some missionaries brought soybean seeds and a little soil to Italy from Japan. They waited for the cultivation for several years, then nothing else was said. In 1880 the Italian Ministry of Agriculture recommended the cultivation of soybeans as a fodder crop for the future, as was being done in the USA, but their suggestion received no attention. In 1918, according to Mattei, a test of soybean culture was done at the Colonial Garden of Palermo on a parcel of 300 square meters.

Since 1912, after seeds had been brought by foreign delegates to the International Exhibition at Turin in 1911, repeated experiments with soybean cultivation have been conducted at the Bonafous Agricultural Institute in Turin, with the goal of developing two well adapted varieties, one for fodder and one for seed. Their green variety is for fodder and their yellow one for seed.

From 1920 the directorship of the cultural work was given to the head professor at the Institute, Venanzio Manvilli, also professor of the Germano Sommeiller Technical Institute, professor the faculty of agriculture, University of Turin. They worked with seeds already selected from the institute and with those obtained from Prof. Don Ricaldone, and from Tientsin, China, directly. Others who have done important work with soya in Italy are Paolo Bottari (with soymilk at the Bonafous Institute), Tamanini Guido, Mossello and Bellia, Prof. Cav. Giov. Batt. Allaria, Dr. Mose Miccinelli

A table (p. 31) shows soybean and cotton hectareage and production in Korea from 1909 to 1917. Soybean hectareage increased from 277,776 ha to a record 487,134 ha. Soybean

production grew from 1,991,126 quintals (1 quintal = 100 kg or 0.1 metric tons) to a record 3,816,498 quintals.

Page 35: “Prof. Rouest of Luxey (Landes) in France wrote us on 30 Nov. 1921. ‘I have finished only the period of acclimatization of the soybean. It remains for me to propagate it a little everywhere. The experiments of 1921 were extended in all the Departments, being viewed from an industrial and commercial point of view. I must now study which variety adapts among those I am cultivating. Soy flour will not be able to be made until we have many thousands of hectares under cultivation, and then we will be able to think of other applications as well... Actually the firm Hendeberth de Lion sells its flour, originating in China, at 10 French francs per kg, a prohibitive price.’”

Page 206: At the pediatric congress held in Milan in Sept. 1922, the question of lactation (feeding children) with vegetable milk was discussed in a favorable way, proposed by Prof. Muggia and sustained by the illustrious Prof. Berghius, Director of the Pediatric Clinic of the University of Padua, and by Prof. Francioni of Bologna. We can also add that experiments on lactation are proceeding in Italy at the pediatric clinics of Turin, Bologna, Padua, Genoa, and Florence, and also at the Infant’s Dispensary in Turin.

Photos show: (1) Three different varieties of soybean plants (p. 70). (2) 2 soybean plants up close (p. 71). (3) The leaves of 3 different varieties of soybean plants (p. 72). (4) Close-up of the stem and pods of a soybean plant (p. 73). (5) Beans and pods of soybeans (p. 74). (6) Different stages of germinating soybean seeds (p. 75). (7) Close-up of soybean roots (p. 76). (8) Field of soybeans at the “Istituto Bonafous” (p. 106, 108, 113). (9) Field of soybeans grown with corn (p. 122, 123). (10) Cellular transverse section through a soybean (facing p. 152). (11) Pasta made from soy (p. 181). (12) Bread made from soy (p. 183-89).

Note 1. Quite a bit of the historical and non-Italian information in this book comes from Léon Rouest’s 1921 book *Le soja et son lait végétal: Applications agricoles et industrielles*.

Note 2. This is the earliest Italian-language document seen (Jan. 2012) that mentions natto, which it calls “il Natto in Giappone che corrisponde al *Tao-Teche* della Cina.” Address: Dr. of Economic and Commercial Science, Turin [Torino], Italy.

163. Kempfski, Karl E. 1923. *Die Sojabohne: Geschichte, Kultur und Verwendung unter besonderer Beruecksichtigung der Verhaeltnisse in Niederlaendisch-Indien* [The soybean: History, culture and use, with special attention to the situation in the Netherlands-Indies]. Berlin: Paul Parey. 88 p. Illust. Index. 22 cm. [101 ref. Ger]

• **Summary:** Contents: Introduction. Some remarks on the soybean’s early history. Overproduction of soybeans in Manchuria after the Russo-Japanese War—English oil mills make their first trials. Soybean production in Manchuria.

Soybean production in Korea. Soybean production in Japan. Soybean production in America—Soybean meal and soybean milk are introduced. Soybean production has also expanded in Africa, British India, and the Philippines. The introduction of soybean cultivation to Europe. The many uses of the soybean in Europe. Uses of soy oil. Old and new methods of obtaining soy oil. Soybean production and use of soybeans in the Netherlands-Indies. Appendix: Descriptions of how the most important soybean products are manufactured: In Java (tao-hoe [tofu]), tempeh, ketjap [soy sauce], tao-tjong [or tao-jiung, a term, and perhaps a product, between *doujiang* and *tao-tjo*, Indonesian-style miso], in China and Japan (soy sauce, miso, tofu, frozen tofu, natto, soymilk) (p. 62-68). Supplements: I: Soybeans in Manchuria. II; Hansamuehle [Hansa Muehle] in Hamburg, Germany. III: *The Soybean* by Piper and Morse.

Note the extensive, early bibliography. Unfortunately, it contains many errors.

This book is largely a review of the literature, but with some original information, especially on Indonesia and Germany. In 1923 Java imported 150,000 to 200,000 tons of soybeans and had a population of 35 million. The area of soybeans planted in Java (including Madura) increased from 157,600 ha in 1918 to 164,700 ha in 1922 (p. 32). In 1921, 67.3% of Java’s soybean acreage was in Central Java, 20.7% was in East Java, and only 5.7% was in West Java. (p. 35). Large quantities of soybeans are imported to the Netherlands-Indies from Manchuria: 35,105 metric tons (tonnes) in 1920, rising to 95,742 tonnes in 1922. From these and local soybeans are made tempeh [spelled like this!], tofu (*tahoe; Bohnenkäese*), soy sauce (*Ketjap, Sojasauce*), etc. In Java, mostly black soybeans are grown. To make tofu yellow, it is cooked in an extract of the *Curcuma* root / rhizome. Sometimes it is also sun-dried or fried/roasted (*gebraten*). Tempeh is inoculated with a piece of tempeh from a previous fermentation, and often fried in coconut oil. Detailed descriptions are given of the production of soy sauce (*ketjap*; which is made from black soybeans) and Indonesian miso (*taucho; tao-tjong*). The author (p. 64) states that ketjap and tao-tjiung are both inoculated using *Hibiscus tiliaceus* (hibiscus) leaves, called *waroe* in Java. Today Germany, like America, produces fresh and dried soymilk, fresh and dried soya cream, meat analogs, and soy sauce (p. 25).

This book contains 17 interesting, old photos. Descriptions of those reproduced from other periodicals are omitted. (1) A soybean field on the farm Kikai Nojo near Sempo-Station, Korea, owned and run by Mr. Moegling (p. 12). (2) A combine used for harvesting regular beans in California in 1918 (p. 19). (3) Many hydraulic presses in a modern American oil factory (p. 29). (4) The equipment used in steaming the soybeans before they are crushed in an American “steam mill” type oil mill (p. 31). (5) The interior of a British oilmill (p. 33). (6) The electrical generators in a modern oilmill (p. 34). (7) Soybeans being harvested

manually at Madioen [Madiun, in East Java], Java (p. 48). (8) Harvested soybeans being dried on racks in a field in Java, and carried away by one worker (p. 48). (9) Workers dividing up the harvest in Java (p. 50). (10) Threshing soybeans with bamboo flails in the courtyard of a small farmer in Java (p. 51). (11) Selling soybeans in a small market in Central Java (p. 51).

Tables show: (1) Imports of soybeans to Germany from 1910 (43,500 tonnes) to 1912 (more than 125,200 tonnes) (p. 24). (2) Soybean acreage in Java (including Madoera) from 1918 (157,600 ha) to 1922 (164,700 ha) (p. 32). (3) A breakdown of soybean area in Java in 1921 (of 226,186 bouws) into West Java (12,980 bouws), Central Java (152,154 bouws), and East Java (61,082 bouws) (p. 35). Note: 1 bouw = 1.754 acres (Johnstone 1975). (4) Imports of Manchurian soybeans to Java (including Madoera) and other parts of the Dutch East Indies (mainly Sumatra) from 1920 to 1922 (p. 36). (5) Yields (average or range) of soybeans in various countries: Germany, Italy, British Indies, Manchuria (incl. China and Korea), Japan, America (up to 2,700 kg/ha), Java (p. 52). (6) Comparison of the nutritional composition of soybeans, peas, and regular beans (*Phaseolus* varieties) (p. 53). (7) Comparison of the nutritional composition of soya cheese (*Sojakäse*, tofu), beef, and lean pork (p. 53). (8) The prices of white and of black soybeans in Java during January and December 1922 and the same two months of 1923 (in Gulden) (p. 56). (9) Comparison of yields, price, costs, and profit for peanuts (*Katjang tanah*) and soybeans in Java (p. 57-58). (10) Nutritional composition of canned frozen tofu (based on E. Senft) (p. 68). (11) Exports of soybeans from five Manchurian ports (Dairen, Antung, Newchwang, Suifenho [Suifenhe], and Sansing) in 1919, 1920, and 1921 (p. 70). (12) Exports and value of soybeans from all of China to four countries (Netherlands, Russia, Japan, Dutch East Indies) in 1919, 1920, and 1921 (p. 72). (13) Exports of soybean oil from five Manchurian ports (Dairen, Antung, Newchwang, Suifenho [Suifenhe], and Harbin) in 1919, 1920, and 1921 (p. 72). (14) Exports and value of soybean oil from all of China to five countries (England, Netherlands, Belgium, Japan, USA) in 1919, 1920, and 1921 (p. 72). (15) Exports of soybean meal from four Manchurian ports (Dairen, Antung, Newchwang, Suifenho [Suifenhe]) in 1919, 1920, and 1921 (p. 73). (16) Exports and value of soybean meal from all of China to three countries (Japan, Russia, USA) in 1919, 1920, and 1921 (p. 73). (17) Names of the five major railway lines in Manchuria (South Manchuria Railway, Chinese Eastern Railway, Peking Mukden Line, Kirin-Changchun Line, Sauping-kai-Taonan Line) (p. 74). (18) Amounts (in tons) of soybeans, soybean cake, and soy oil (*Sojaöl*) shipped over the South Manchuria Railway, and the Chinese Eastern Railway in one year (p. 74). (19) Railway transport and production amounts of the mills (in tons) in Dairen and Newchwang of soybeans, soybean cake, and soy oil (*Sojaöl*) during the year 1921 (p. 74). Address:

Agricultural Expert in Poerbasari te Pengalengan, Java.

164. *Wochenschrift fuer Brauerei*. 1923. Ueber die Zerstoerungstemperatur der Koji-Diastase in waesseriger Loesung und die Wiederherstellung ihrer Wirksamkeit nach dem Erhitzen [On the lethal temperature of koji diastase in aquatic solution and the recovery of its action after heating (Abstract)]. 40(26):156. [1 ref. Ger]

• **Summary:** A German-language summary of the following English-language article: Miyake, Koji; Ito, Mitsuji. 1923. "On the lethal temperature of koji-diaastase in aquatic solution and the recovery of its action after heating." *J. of Biochemistry* (Tokyo) 2:255-70.

165. Faber, Sandor. 1924. A szójabab jelentősége és termelése [The significance and cultivation of the soybean]. *Gazdasági Lapok (Agricultural Papers)* 5:49. [Hun] Address: Hungary.

166. Laxa, Otakar. 1924. Syrarstvi: Popis vyroby a upravu syra jako potraviny [Cheese production: Production of cheese and its productivity as a food. 2nd ed., revised and enlarged]. Prague: Ceskolovenske Podniky Tiskarske a Vydavatelске. 539 p. See p. 522-24. Series: Zemedelska Knihovna, edited by Prof. Dr. Alois Velich. [Cze]

• **Summary:** In the section titled "Vegetable Cheeses" (p. 522-24), the author discusses tofu, natto, kori-tofu [dried frozen tofu], and miso. Address: Prof., Dr., Czechoslovakia.

167. Minami Manshû Tetsudô K.K. Kôgyô-bu. Nômu-ka. [South Manchuria Railway Co., Industrial Div. Bureau of Agriculture]. 1924. Daizu no kakô [Soybean processing]. Dairen, Manchuria: SMRC. 777 p. 30 cm. (Sangyo Shiryo 21). [250 ref. Jap]

• **Summary:** Name of company with diacritics is: Minami Manshû Tetsudô K.K. Kôgyô-bu. Nômu-ka. This important, major work was written by Yoshitane Satô. Contents: Photos (on unnumbered pages at the front of the book) show 16 scenes of soybean transportation, storage, and processing in Manchuria, as follows: (1) Mule drivers whipping mules trying to pull carts loaded with large sacks of soybeans over muddy roads. (2) Cylindrical osier storage bins for soybeans. (3) Row upon row of sacks of soybeans piled high in storage near docks. (4) Soy sauce being made in a courtyard; each earthenware jar is covered with a woven conical lid. (5) The inside of a huge and modern soy sauce plant. (6) Wooden kegs and glass bottles of Yamasa shoyu. (7) Soy sprouts growing in round woven baskets. (8-11) Soy oil being pressed using vertical screw presses [as an alternative to hydraulic presses]—four views. (12) Boilers used in a soybean mill. (13) A wooden barrel of soybean oil being sealed. (14) Soy oil packaged in many small containers, each surrounded by a wicker basket. (15) Round soybean cakes stacked high on railway flatcars. (16) The inside of a modern

soy oil factory.

Contents: 1. Current status of soybean production and consumption: A. Production: Overview (p. 2), Japan (p. 4), Korea (p. 12), Manchuria (p. 16), China (except 3 eastern provinces, but including Eastern Inner Mongolia, p. 31), USA (p. 34), British colonies (p. 37), European countries (p. 40). B. Consumption: Japan (p. 41), Korea (p. 52), Manchuria (p. 57), China (p. 59), Dutch East Indies (Indonesia, p. 60), USA (p. 61), European countries (p. 63).

2. Characteristics of soybeans: A. From a physical sciences viewpoint (p. 67): Structure (overview, cotyledons, hypocotyl, seed coat), contents of each system (p. 70), appearance (p. 73; color, gloss, shape, size, hilum (*fusuma*) color, young plumule leaf color, ratio of seed to seed coat). B. From chemical viewpoint (p. 82): General composition, structure of each component (p. 109; protein, oil, carbohydrate, ash/minerals, vitamins). C. Appearance and relationship between oil and protein content (p. 126): Oil and protein color related to color, glossiness, shape, size, hilum color, young plumule leaf color. D. Evaluating soybean quality (p. 140): Overview, key points (sizes, shapes, colors, glossiness, hilum color, young plumule leaf color, ratio of seed coat to seed, dryness of seed, volume, weight, smell, mixing of different varieties, ratio of imperfect seeds, amount of other types of seeds), collection of materials for testing, testing and evaluating commercial soybeans.

3. Soybean usage and processing (p. 175). A. One view of main usage of soybeans. B. Nutritional value of soybeans as food (p. 183): Nutritional value of soy protein. C. Processed soyfoods (p. 208): Soy sprouts (p. 208), natto (*itohiki nattô*, p. 212, Hamanatto, p. 224), types of tofu (regular tofu [*nama-dôfu*, p. 226], *kori-dofu* or *koya-dofu*, p. 240, aburaage, p. 245, tofu curds [*tofu nô*, p. 247], hard tofu [*tofu-kan*, p. 247], fragrant hard tofu [*kô-kan*, p. 248], *senchô tofu*, p. 249, fermented tofu [*nyûfu* or *funyû*, p. 249]), *tofu-p'i* or yuba (p. 256), soymilk and artificial cow's milk, p. 259, soybean flour raw, or roasted (kinako, p. 263), shoyu (p. 266; overview of miso and shoyu, Japanese traditional regular shoyu, p. 267, Japanese traditional special shoyu and tamari, p. 269, Chinese soy sauce, p. 272, recent shoyu research and development, p. 274), miso (p. 280; Japanese traditional regular miso, Japanese traditional special and processed miso, p. 282, Chinese miso, recent miso research and development, p. 285). D. Soybeans as feed or fodder (p. 287; green soybeans as feed, p. 290): Fresh forage, dried forage or hay. E. Soybeans as manure or fertilizer (*hiryô*, p. 297; in the Kaijô area of Manchuria, have been roasted and steamed, and mixed with compost, and used for green manure (*ryokuhî*) or soybean cake (*daizu kasu*). This method has also been used in the northeastern provinces (*Tohoku Chiho*) of Japan in rice fields). F. Soybeans as oilseeds (p. 302). G. Use of soybean protein in industrial products (p. 304).

4. The soy oil extraction industry (p. 305): A. Methods of removing the oil (origins, traditional methods, hydraulic

pressing, extraction method, p. 340). B. Advantages and disadvantages of each method (p. 348). C. The soy oil industry in Manchuria (p. 357): History of development, important places for soy oil on the Manchurian Railway, economic condition of the Manchurian oil industry (p. 420), oil extraction in Japan (history, p. 437, commercial factories, p. 442, development of these factories, p. 451).

5. Soybean meal or cake and its composition (p. 464). A. The varieties of soybean meal or cake and the composition of each. B. Evaluation of quality (p. 473). C. Soybean meal or cake as a fodder (p. 478): Feeding value and digestibility, incorrectness of the theory that there are bad effects from feeding soybean meal or cake (p. 479). D. Soybean meal or cake as a fertilizer (p. 490). E. Soybean meal or cake as food (p. 504): Use as a raw material for shoyu production (p. 506), use to make soy flour (p. 509). F. Soybean meal or cake as a source of protein in industrial products.

6. Soy oil and its processing (p. 526). A. Characteristics of soy oil: Composition, physical characteristics (p. 535), chemical characteristics, testing and evaluating soy oil (p. 564), the quality of commercial soy oil products (p. 577). B. Refining soy oil (p. 587). C. The use and processing of soy oil (p. 631): Overview, refined soy oil as a food, substitute for salad oil, or for deep-frying oil, as an illuminant, as a cutting oil, lard substitute, margarine, in paints, soap, hardened oil, for waterproofing, substitute for petroleum oil, glycerin, fatty acids, stearine.

7. Exports and imports of soybeans, soybean meal or cake, and soy oil (p. 708). A. Manchuria. B. Manchurian exports. C. China. D. Japan. E. Korea. Appendix: Bibliography of soybeans (Japanese-, German, and English-language works; p. 748). List of photos.

Note 1. This is the earliest Japanese-language document seen (Oct. 2011) that mentions fermented tofu, which it calls *nyûfu* or *funyû*.

Note 2. This is the earliest Japanese-language document seen (Feb. 4) that uses the term *itohiki nattô* to refer to natto. Address: Dairen, Manchuria.

168. Toriyao, Yoichi. 1925. *Nattô no enkaku ni tsuite* [History of natto]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 2(8):736-39. [Jap]

• **Summary:** An excellent history of natto in Japan. Address: Osaka Koto Kogyo Gakko, Japan.

169. Oshima, Kokichi. 1925. *Nattô-kin no koso kagaku-teki kenkyû*. I. *Nattô-kin tanpakushitsu bunkai kôso no seishitsu* (1) [Enzymatic study on natto bacteria. On the properties of the proteolytic enzyme of natto bacteria (1)]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 3(3):287-300. [18 ref. Jap] Address: Hokkaido Teikoku Daigaku, Suisan Senmon-bu, Kyoju; Ken Hokkaido Teikoku Daigaku Jokyoju, Japan.

170. Ito, Takeo. 1925. *Nattô no seibun ni tsuite* [On the

constituents of natto]. *Nogaku Kaiho (J. of the Scientific Agricultural Society, Japan)* No. 266-71. p. 85-86. [Jap]

171. Oshima, Kokichi. 1925. Nattô-kin no kôso kagakuteki kenkyû. I. Nattô-kin tanpakushitsu bunkai kôso no seishitsu (1) [Chemical research on the enzymes from natto bacteria, *Bacillus natto*. I. Properties of the protease (1)]. *Sapporo Norin Gakkaiho (J. of the Society of Agriculture and Forestry, Sapporo)* 16(71):387-405. [17 ref. Jap; eng] Address: Sapporo, Japan.

172. Oshima, Kokichi. 1925. Nattô-kin no kôso kagaku-teki kenkyû. I. Nattô-kin tanpakushitsu bunkai kôso no seishitsu [Enzymic study on *Bacillus natto*. I. The properties of protease A, the proteolytic enzyme of natto bacteria]. *Sapporo Norin Gakkaiho (J. of the Society of Agriculture and Forestry, Sapporo)* No. 71. p. 7-23, 24-25 (16(71):387-403). English-language summary. p. 404-05. [17 ref. Jap]

• **Summary:** Sawamura (1907) was the first to isolate *Bacillus natto* from natto. He was followed by Muramatsu (1912) and Iguchi (1917). This bacterium much resembles *Bacillus subtilis* morphologically and physiologically, but it produces a distinct flavor and mucilaginous substance on cooked soybeans. The analysis of natto shows the increase of soluble nitrogenous matter and the formation of strong protease, which makes soybeans more nutritive. This study analyzes the bacillus from the viewpoint of enzymic chemistry. Address: Hokkaido Teikoku Daigaku, Suisan Senmon-bu, Kagaku Kyoshitsu.

173. Carqué, Otto. 1925. Natural foods: The safe way to health. Los Angeles, California: Carqué Pure Food Co., Inc. 359 p. Illust. Index. 20 cm.

• **Summary:** Contents: Part I: Fundamental facts about food and health. 1. The old and new conceptions of the cause of disease. 2. Drug medication, vaccination, and serum therapy. 3. Nature's healing factors: Sunlight, fresh air, exercise, rest, water, the importance of natural foods for life and health, why denatured foods (white flour, refined sugar, candies, etc) are injurious. 4. The constituents of food considered in the light of modern physiology and biology: Proteins, carbohydrates, fats and oils, cellulose, fruit acids are organic acids, organic salts, the alkaline or base-forming elements (iron, sodium, calcium, magnesium, potassium, manganese, and aluminum), the acid-forming elements (phosphorus, sulphur, silicon, chlorine, fluorine, iodine, bromine, arsenic), the vitamins. 5. Rational soil culture essential for the production of superior foods. 6. The conservation of vital force (stimulants, narcotics, elimination of waste, quality of foods, prolongation of life, alkaline and acid-forming foods). 7. Why the calorie theory is misleading. 8. Fruit, man's best friend (the fruit of the tree, sulphured and unsulphured fruits). 9. Nuts—Nature's most concentrated foods. 10. Vegetables—Nature's blood purifiers (Great

hygienic value of green leaves, proper soil fertilization most essential to vegetable culture, loss of organic salts in cooking, classification of vegetables—5 classes). 11. Cereals and legumes (Cereals falsely called “The staff of life,” whole grain products are the best, the great waste of food elements by modern milling processes, legumes—an important food). 12. Milk and dairy products (Milk not a perfect food for adults). 13. Meat—the least essential and most expensive of all foods (the vegetarian alternative).

Part II: Practical dietetics. 14. How to live well on less food. 15. The feeding of infants and children (lactation, almond milk, soy bean milk). 16. The rational preparation of foods. 17. Rational food combinations (importance of simplicity of eating, the mono-diet and its advantages). 18. Simple and well balanced menus for all seasons. Appendix: Tables and statistics. A1. Analyses showing the amount of sodium, calcium and iron in foods. A2. Amount of food materials necessary to supply one ounce of protein. A3. Amount of calories contained in one pound and one ounce of 200 food products. A4. Average time required for gastric digestion of foods. A5. Annual consumption of sugar, soft drinks, salt, spices, coffee, tobacco, drugs, alcohol, etc., in the United States. A6. Regulations for the enforcement of the Food and Drug Act. Important information about chemical preservatives and artificial colors.

The Preface (and the book) begins: “Two powerful superstitions are impeding the welfare and progress of the human race. The one is the conviction that disease is an entity, a mysterious something that attacks us without warning from the outside, either in the form of germs or as inclemency of weather. The other—perhaps the more harmful of the two—is the belief that for each disease specific remedies must be found, such as drugs, serums, vaccines, glandular extracts, etc., and that, when we are afflicted, we have to submit to a specialist's treatment or even to the affected parts or organs.”

The average individual tries “to shift the responsibility for his sins of omission or commission to some imaginary cause, rather than to hold himself accountable for the violation of nature's laws.” There is “almost universal ignorance of the fact that disease is merely an effort on the part of nature or the universal life force to restore normal conditions in the organism. Our present system of commercialism has taken advantage of this situation by misleading people through clever advertising to persist in their errors in order to maintain the demand for drugs and serums, proprietary medicines,...

Chapter 11, “Cereals and Legumes,” briefly discusses many types of soyfoods—soy sprouts, milk, flour, tofu, soy sauce, and oil (p. 142). Page 196 discusses the use of soy bean milk and almond milk for feeding infants and children. Chapter 16, titled “The Rational Preparation of Foods,” contains a long and detailed section on soy beans (266-71), with subsections on boiled soy beans, soy bean milk, tofu,

soy sauce, and soy bean sprouts. Home preparation of each is described. Miso, yuba, natto, and hamananatto are also mentioned (p. 268). Soy-related recipes include: Baked soy beans (p. 269). Soy bean loaf. Soy bean croquettes. Soy bean bread (p. 270).

Chapter 9, about nuts, states: “The making of nut butters is not a difficult process. At present peanuts and almonds are chiefly used for this purpose... The blanching of peanuts and almonds is now done on a large scale by special machinery, and the blanched nuts can be procured in nearly all the larger cities.” Break the blanched nuts into small pieces by running them through the Climax Grater or a food chopper. Put them into a moderately hot oven for a few minutes to make them dry and crisp, then run them through a tightly adjusted nut mill to create a “smooth, palatable nut butter.” A large table (p. 122) compares the composition of various nuts and nut butters (almond butter, peanut butter) with meat, cheese, eggs, cow butter, and whole wheat bread. “The pecan contains the largest amount of fat, about 70%, closely followed by the hickory nut, brazil nut, filbert and pine nut, which all contain over 60% of fat. The pignolia imported from Spain ranks highest in the amount of protein, containing nearly 34%; the peanut comes next with 29.8%; the butter nut, almond, pistachio, all contain over 20% protein, excelling the best cuts of meat in that respect. The almond does not contain any starch as is, therefore, the nut best suitable for infants, especially in the form of almond milk.” Chufa contains 3.5% protein and 31.6% fat.

The section titled “Fruit and nut confections” (p. 212-15) discusses and has recipes for natural candies and confections.

The section titled “How the American people deplete their vitality by their favorite poisons: The tremendous waste of our material wealth” (p. 328-43) discusses (p. 338-43): The amount spent in 1924 on each of 15 “adulterated foods and drinks and of poisonous stimulants and narcotics” (\$5,040 million) compared with the amount spent on foods and vegetables (\$850 million, or 16.8% as much). Refined sugar. Coffee. Tobacco. Condiments, etc. Alcoholic beverages. Drugs. Regulations for the enforcement of the Food and Drug Act (due to untiring efforts of Dr. Harvey W. Wiley, former chief of the Bureau of Chemistry, USDA). Sodium benzoate and sulphur dioxide. Salt. Saltpeter. Boric acid and borax. Saccharine. Mineral and coal tar dyes. Laxity in enforcement of the Pure Food Law.

On pages 344-47 is information about the Carque Pure Food Company (incorporated 1912) and its founder and owner Otto Carque, including a brief biography of Otto, a list of leading Carque food products, and a full page photo of the company’s new home at 729 Seward St., on 1 Oct. 1925 (2 story brick building).

The food products are arranged by groups: Fruits: Sun-dried and dehydrated, without bleaches or preservatives (Black mission figs, white Smyrna-type figs, prunes, dates,

olives, raisins, apricots, peaches, pears). Nuts: Fresh, selected and unroasted (almonds, walnuts, Brazil nuts, pecans, pignolias, pistachios, peanuts). Confections: Of assorted fruits, nuts and honey, without sugar, salt, glucose or preservatives (delectables, fruit nuggets, Kandy-Andy). Stamina and laxative foods (Nut-Fruto, Prunola {prunes and olives}, fruit laxative). Nut butters: Ground from whole nuts, uncooked and unsalted (almond, nut cream, peanut). Cereals and products: Made from re-cleaned whole grain (wheat flour, yellow corn meal, brown rice, breakfast food, crackers). Miscellaneous (olive oil, strained honey, raw sugar, fig-cereal breakfast drink {instead of coffee}). Price list and descriptive circulars on request.

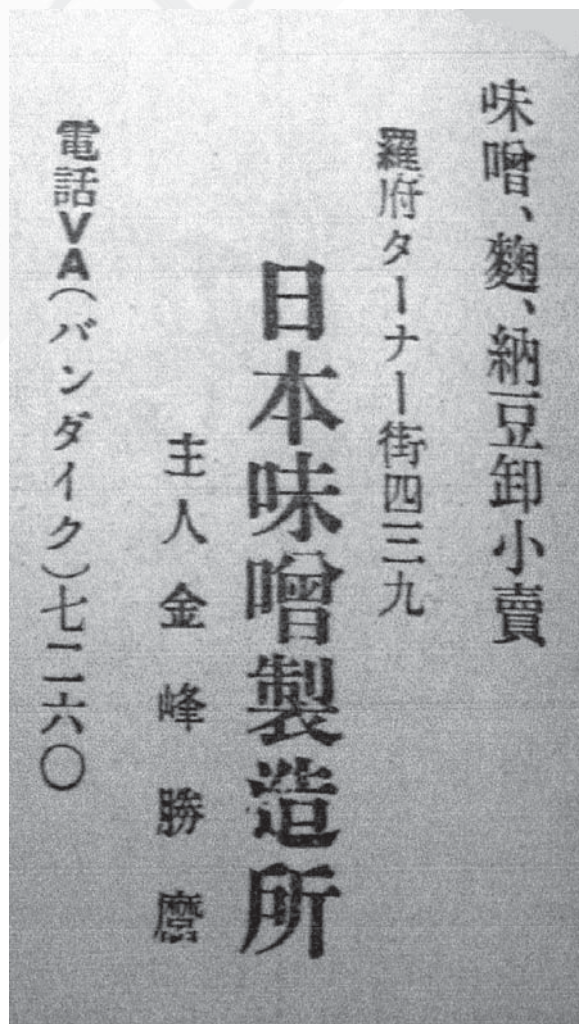
Note: This is the earliest English-language document (or book) seen (June 2004) with the term “Natural foods” in the title that also discusses soy. Address: Los Angeles.

174. **Product Name:** Natto, and Koji.

**Manufacturer’s Name:** Nihon Miso Seizo-sho.

**Manufacturer’s Address:** 439 Turner St., Los Angeles, California. Phone: VAndike 7260.

**Date of Introduction:** 1926. January.



**New Product–Documentation:** The Japanese American Directory. 1926. p. S-33 (directory) and p. S-73 (¼-page ad; the company now makes miso, koji, and natto. Sells wholesale and retail).

Note: This is the earliest known commercial natto made in the United States. We are almost certain that this company makes natto in the USA; it is hard to imagine how they could import it from Japan and there is no other known natto manufacturer in the Western world. As of June 2008 some natto is imported frozen to the USA from Japan.

175. Ito, Takeo. 1926. Nattô no seibun ni tsuite [On the composition of natto]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 2(1):32-38. Jan. [8 ref. Jap]

Address: Nôgaku-shi, Japan.

176. Yamada, Masakazu. 1926. Yûki enki bunri ni nafutooru o no ôyô ni tsuite (jiamin no shin bunri-hô) [Application of naphthol yellow to the isolation of organic bases. (A new method for the isolation of diamines)]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 2(4):246-67. English abstract bound in the back. Vol. 2, No. 4. p. 39-41. [10 ref. Jap]

• **Summary:** The author applied to sake and shoyu the method proposed recently by A. Kossel and K.E. Gross (*Z. Physiol. Chem.*, 135, 167-74, 1924) for the isolation of arginine and naphthol yellow. He was able to obtain much crystalline precipitate in the shoyu, but none in the sake. This precipitate was easily recrystallized from boiling water in beautiful rosettes, which were found to be the mixture of the double salts of putrescine and cadaverine with the naphthol yellow. The precipitation in shoyu was caused by “salting out.” The author also used naphthol yellow to precipitate bases (cadaverine picrate) from tamari shoyu, Hatcho miso, inaka miso, and natto. Address: Nôgaku-shi, Japan.

177. Yamada, Masakazu. 1926. A new method for the isolation of diamines. *J. of the Agricultural Chemical Society of Japan* 2(4):39-41. April. Whole issue no. 19. [Eng]

• **Summary:** 1.08 g kadaverin pilerat is obtained from 1 kg of natto.

Note: At the top of p. 39 is written: “Abstracts from original papers.”

178. Zlatarov, Asen. 1926. Die Soja und ihre Verwertung als Nahrungsmittel [The soybean and its use as food]. *Fortschritte der Landwirtschaft* 1(7):543-47. Sept. 1. [8 ref. Ger]

• **Summary:** On this document, the writer’s name is written “Prof. Dr. Assen Zlataroff.”

In Bulgaria as elsewhere in Europe, people have started to plant lots of soybeans. The soybean can serve as a source of healthy and rich nutrition, but also as a new source of

income. There is much recent interest in Hungary and Germany.

Tables show: (1) Thirteen nutritional analyses of soybeans planted in Bulgaria between 1917 and 1922. (2) Nutritional analyses of black beans (non-soy), black peas, white beans, white lentils. Garbanzo beans (Chickpeas / chickpeas / *Kichererbsen*). And soybeans (*Soja*). The soybean is low in purines. (3) Soy oil constants (yellow variety, ether extract), including specific weight, saponification number, Reichert-Meissel number, iodine number, Hennersche number. (4) Nutritional composition of Papuda beans in 4 districts of Bulgaria in 1920 and 1921. (5) Weight of distilled water absorbed by 100 gm (800 beans) of soybeans after seven lengths of time ranging from 15 minutes to 12 hours. (6) Nutritional composition of soymilk (*Sojamilch*). (7) Comparative nutritional composition of various mammalian milks: Human milk, cow’s milk, buffalo milk, sheep’s milk, goat’s milk. (8) Nutritional composition of tofu (*Tevu-fou*, *Sojakäse*, based on previous analyses by Champion and Lhote, Prinsen, and König {both fresh and dry}). He notes that tofu resembles quark. (9) Nutritional composition of soy casein (*Kaseo-Sojain*).

The value of the soybean as food: In China and Japan the soybean is used in large quantities as food. These foods include soymilk, soya cheese (*Sojakäse*), soya casein (*Sojakasein*), soybean meal, natto, miso, shoyu (*Schoyou*), Tao-you, Indonesian-style soy sauce (*Ketjap*), Vietnamese-style miso (*Tuong*), *Kiju-tze*, soya coffee (*Sojakaffee*), soya salad (*Sojasalat*), etc.

The soybean as a vegetable (green vegetable soybeans).

He then describes briefly how to make various soybean food products (based on Li Yu-ying and Grandvoinet) including soya flour (*Sojamehl*), soy dumplings (*Sojahlösse*), soymilk (*Sojamilch*, discovered by the Chinese philosopher Whai Nain-Tze), tofu (*Sojamehl*, made by coagulation of soymilk; he calls it *Sojamilchquark*, *Sojakäse*, *Tevu-fou* and notes that in China it is called “The meat without bones”). As far as taste is concerned, the writer has tasted tofu and he finds that this fresh cheese tastes very nice and the type of cheese made from it (by Li Yu-ying) such as Roquefort, Gruyere, Holländer, etc. are in no way inferior to the renowned real cheeses. Making tofu could be a new industry, which would be a good source of income for the nations where the soybean thrives and conducive to the nutrition of the people. Fresh tofu has many uses in cookery. With eggs it makes a fine omelet, likewise cheese dumplings and sausages. All these products have a fine taste and are very nutritious. In 1921 Dr. Assen Zlataroff (a nutritionist) and J. Trifoneff wrote (in Bulgarian) a brochure on the soybean, its cultivation, composition, and food value. Address: Sophia Medizinisch-chemisches Institut, Bulgaria.

179. *Jozogaku Zasshi (J. of Brewing, Osaka)*, 1926. Shojo: Seimai, daizu, komugi, mugiyasu, ômugi, seishu, shoyu,

miso, tsukemono [State of commerce: Rice, soybeans, wheat, rye, barley, refined sake, shoyu, miso, pickles]. 4(4):360-61. [Jap]

180. Mayerhofer, Ernst; Pirquet von Cesanatico, C. eds. 1926. *Lexikon der Ernahrungskunde* [Dictionary of dietetics]. Vienna, Austria: J. Springer. viii + 1205 p. Illust. 25 cm. [Ger]\*

• **Summary:** Included in the long list are: Akamiso, miso, shiromiso, tofukasu [okara], daizu [soybeans], fu [dried wheat gluten cakes], kingyo-fu, kiri-fu, kiri-mochi [frozen and dried rice cake], ame [malt extract], mirin, aburage [tofu fried in vegetable oil], natto–Bohnenkäse, Tofu–Sojatopfen, Tonyu–Sojamilch [soymilk], azuki [small red beans], kwansen-fu, kinako–Sojabohnenmehl, geröstet, amasake [amazake]–unvergorener Sake, umeboshi, koritofu [frozen and dried tofu], midzuame [soft ame = rice syrup], shoyu–Sojasauce, yuba–eine Bohnenspeise. Note that a number of these terms are Japanese.

Note 1. This is the earliest German-language document seen that mentions amazake, which it calls “amasake.”

Note 2. This is the earliest document seen (Aug. 2002) in any language that uses the term *tonyu* (or *tönyū* or *tonyū*) to refer to soymilk.

181. Saito, Akio. 1926. [Chronology of soybeans in Japan, 1900 to 1926, last half of the Meiji period and all of the Taisho period] (Document part). In: Akio Saito. 1985. *Daizu Geppo* (Soybean Monthly News). Feb. p. 12-14. [Jap]

• **Summary:** 1901–Crushing of soybeans starts in Japan. Owada Seisakusho of Tsuruga, Fukui prefecture, Japan, starts making soy oil and soybean cakes using the press method (*assaku-ho*).

1901–Nakahara Kota is issued a patent on his process for making dried-frozen tofu indoors in a freezer (*jinko kōri-dofu*). This makes it possible to produce a good-quality product year round. This year there are 453 makers of dried-frozen tofu in Nagano. Nagano prefecture encouraged production of this product during the Russo-Japanese War as a side home industry.

1901–Soybean production in Japan reaches 525,000 tonnes, topping 500,000 tonnes for the first time.

1905–After Japan’s victory in the Russo-Japanese War, it is said that maybe, because of the victorious mood, tofu makers start to blow a horn while selling tofu.

1905–At about this time, soybean cake (*daizu kasu*) passes fish cake to become the main fertilizer for crops in Japan.

1905–Shin Sawamura (lived 1865-1931) discovers the main natto bacteria and names it *Bacillus natto* Sawamura.

1906–Neda Tadamasu of Akita prefecture develops a new type of soybean. Named the Akita, it is a cross between Shirosaya and Itoi’s Ani.

1907 March–Nisshin Mamekasu is founded (initial

capitalization is 3,000,000 yen). The next year its soybean crushing plant in Dairen, Manchuria, starts to operate. In 1918 the company merged with Matsushita Mamekasu to become Nisshin Seiyu K.K.

1908–At about this time the retail price of tofu in Tokyo is 1 *sen*. The average cake of tofu weighs over 100 monme (1 monme = 3.7656 gm or 0.1325 oz), so over 376 gm. In 1982 the average price of tofu is 100 yen per cake and the average cake weighs 300 gm.

1914–The Mogi Saheiji family in Noda starts to sell shoyu in 1-sho bottles (1 *sho* = 1.805 liters or 3.81 pints). Before this time a ceramic sake bottle (*tokkuri*) was used.

1914–Yamada Hikozauro of Nagano prefecture succeeds in making dried-frozen tofu (*Koya-dofu*) for the first time in the *Shimi-dofu* area.

1915–From this year until 1919, the soybean oil industry in Japan is in a period of prosperity. In 1914 Japan produces 7,105 tonnes of soy oil and 92,325 tonnes of soybean cake. Just 5 years later, in 1919, these figures have risen about 13-fold to 30,658 tonnes of soy oil and 353,288 tonnes of soybean cake. Soybean cake becomes very widely used in Japanese agriculture.

1918–The mayor of Tokyo, Tajiri Inataro, recommends that people eat low-fat soybean cake cooked with rice (*mamekasu meshi*) to protect themselves from the rapidly increasing price of rice; he himself eats this dish every day. Hiroetsu? Takako (a woman educator, lived 1867-1949) cooked soybean cake and rice (*mamekasu gohan*). Dr. Saei Tadasuke (1876-1959, a nutritionist) introduces an inexpensive meal (it costs 3 *sen* 5 *rin* for 5 people) using tofu and fish bones for breakfast and dinner at the Inexpensive But Nutritional Cookery Seminar (*Eiyo Anka Ryori Koshukai*). This year 30-50% of Japanese don’t have enough to eat. The demand for beef tendons and okara increases. The price of high-quality meat increases faster than the price of tofu.

1919–Artificially cultured pure-culture natto starts to be used. Hanzawa Jun of Hokkaido University (1879-1972), using this method, invents a new “Sanitary Natto Container” (*Eisei Natto Yoki*) made of thin slabs of wood (*kyogi*). He also founds the “Natto Container Improvement Association” (*Natto Yoki Kairyo-kai*)

1919–Soybean production in Japan reaches 502,200 tonnes, and soybean imports rise to 168,000 tonnes. Production of soybean oil reaches 8,853,600 gallons or 33,573,000 liters, equal to that of rapeseed oil.

1919–A machine or kit for making tofu or soymilk easily at home (*kateiyo tonyu-ki*) is marketed.

1920–Soybean production in Japan reaches a record 559,000 tonnes.

1920–Tsugano Akisaburo of Tokyo invents a quick method for fermenting shoyu (*shoyu sokujo-ho*). By adding salt water to soybean koji to make moromi, he is able to make shoyu in less than 10 days.



1922 April—The oil production department of Suzuki Shokai [which went bankrupt in 1922] becomes independent and founds Hohnen Oil Co., Ltd. (*Hohnen Seiyu*).

1923 Sept.—The Great Kanto / Tokyo Earthquake (*Kanto Daishinsai*) strikes. 70% of the miso factories in the area are burned down, causing a shortage of miso. But miso makers in other parts of Japan use this opportunity to ship their miso to Tokyo, and the people of Tokyo come to realize the good taste of miso made elsewhere in Japan.

1924—Kodama Shizutoshi? (or Shintaro) invents another quick method for fermenting shoyu (*shoyu sokujo-ho*) using acid or alkali to hydrolyze soybeans or soybean cake to make shoyu.

Note: This is the earliest document seen (April 2001) that mentions shoyu made by acid hydrolysis. Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

182. Horvath, A.A. 1927. The soybean as human food. *Chinese Economic Journal* 1(3):298-309. March. [24 footnotes. Eng]

• **Summary:** Contents: Soybean milk for food: Introduction. Preparation of soybean milk. Properties (Yu-P'i is Chinese for yuba; Laxa). Market prices. Composition. Nutritive value. New methods in the manufacture of soybean milk (Prof. Laxa in Prague [Czechoslovakia], Li Yu-ying, Soyama). Some dietetical advantages and applications of the soybean milk. Condensed soybean milk and milk powder (Soy Lac soybean milk powder made in America by Chard). Soybean cake, soybean meal and soybean flour as material for soybean milk. Yu p'i and yu ba (yuba; also fu chu).

"In 1905, Li Yu-ying submitted a paper on the subject [of soybean milk] to the 2nd International Milk Congress in Paris, in which he emphasized that the introduction of soybean milk to Western countries 'will be highly beneficial to public health as well as to the budget of the poor.' Also by those who advocate and urge a vegetarian diet, a very strong case can be made for this Oriental substitute" (p. 298).

According to Prof. Laxa: "Soybean milk, supplemented with lactose and inoculated with a culture of yoghurt [yogurt] bacteria, coagulates at 40° C. in 4 hours and gives a curd-like acid mass" (p. 300).

"Market prices. In Peking soybean milk is sold in small bottles in portions of about 200-220 cc. labeled 'Bean milk, a Chinese product, the most nourishing food, made by...' For such a bottle, delivered daily, the big factories of Peking asked in 1925 \$1.00 (Mex.) per month. One liter of such milk costs, therefore, about 15 cts. (Mex.)... A fine soybean milk powder, called *Soy Lac*, has recently been prepared in America by Chard" (p. 300-01). Note: This company (Chard) was first referred to by Piper and Morse in 1916 in *USDA Bulletin* No. 439, "The soy bean, with special reference to its utilization for oil, cake, and other products." *Soy Lac* is mentioned again by Horvath on p. 307.

A table (p. 302) compares the composition of soymilk

made in 3 locations (Tsinanfu, China; Peking, China; and Japan) with that of human, cow, and goat milk. Human milk has the lowest protein content (1.25%) and ash content (0.25%); soymilk has about the same protein content as cow's milk (3.3%) but an ash content (0.40%) which is higher than that of human milk but lower than that of cow's milk. Footnote: "To supplement the deficiency of the soybean milk in mineral constituents [such as calcium], it is recommended by von Noorden and Salomon to add to it the salt mixture of Pirquet, which consists of: sodium chloride, 0.3 gm.; potassium chloride, 1.1 gms.; calcium glycerophosphate, 1.7 gms.; magnesium lactate, 0.5 gm.; ferrum glycerophosphate, 0.1 gm. This mixture is called *Nemsalz*. If diluted in 1 liter of water it gives the same percentage of salts as in women's milk" (p. 302).

"In Germany the Soyama factory (in Frankfurt) manufactures soybean fresh milk (mostly from soybeans), soybean normal cream, and also condensed bean milk and cream. Soyama bean milk looks like cow's milk, contains the same constituents, even in larger amount and in a state of finer dispersion. Only its taste is different. According to Fuerstenberg, Soyama milk can be qualified as a special, very valuable dietetic nutrient. The high lecithin content of this preparation adds to its value too" (p. 306). A table (p. 306, based on the analyses of Dr. G. Popp of Frankfurt) shows the nutritional composition of 6 types of Soyama milk and cream preparations: Normal milk. Milk for diabetics. Milk for baking purposes. Normal cream. Cream for diabetics. Cream extra rich in fat (especially for diabetics). "According to von Noorden and Salomon, Soyama preparations may be kept as long as almond milk and Paranut milk. Soyama milk looks just like cow's milk. By keeping, cream separates and it must be shaken before using" (p. 306).

"In using Soyama milk and cream preparations, v. Noorden confirms the following statement of Fischer (for vegetable milk in general): '1. In the stomach soybean milk gives a much finer flocculent precipitate than does cow's milk, produced by acid or even rennet. 2. The ingestion of soybean milk results in a feebler (smaller) secretion of gastric juice; the period of secretion is also shorter. 3. The period of stay in the stomach of the finely flocculent precipitate of the soybean milk is shorter than that of the casein-fat coagulum of cow's milk. 4. The peristaltic motion of the stomach is less after the ingestion of soybean milk and more coordinated than in the case of cow's milk, as shown by X-ray investigation'" (p. 307).

"On the basis of these observations soybean milk is recommended by v. Noorden in cases of gastric and duodenal ulcer, states of peritoneal irritation, hypersecretory conditions of the stomach, disturbances of the motility of the stomach, uric acid diatheses, kidney disturbances, conditions with edema where a food poor in sodium chloride is required, Basedow's disease, cholecystitis, cirrhosis of the liver, diabetes, and in cases where a very nutritious diet is

required” (p. 307).

“Soybean milk powder will undoubtedly have a successful future in the Orient as well as in European countries and the United States. Its great advantage in comparison with cow’s milk powders is its cheapness. Soybean milk powder can be easily stored and transported... It is believed that at present some of the commercial milk powders contain an admixture of soybean milk powder” (p. 307-08).

“*Yu P’i* and *Yu Ba* are the Chinese and Japanese names of the pellicula formed on the surface of soybean milk when the latter is gently heated. Good *Yu Ba* has a bright yellow color when properly dried. The best *Yu Ba* is that obtained after the first heating. In repeating the heating of the remaining soybean milk, pellicules of gradually inferior quality and color are obtained. As much as 30 pellicules can be secured from the same portion of soybean milk. In China, a product called *Fu Chu* is manufactured in a way similar to *Yu Ba* (Footnote: See this journal, Vol. VIII, 1926, p. 179). Recently an improved method for the manufacture of *Yu Ba* was patented in Japan, consisting in the use of an electric fan adjusted over the surface of a kettle containing the soybean milk heated to a temperature of 90°C.

“*Yu Ba* has a great nutritive value, as it contains a high percentage of protein and fat,...”

A table (p. 309) gives the nutritional composition of five types of yuba: Common yuba, Kyoto yuba, Shimada yuba, Peking yuba, and Fu chu.

Note: The values for Fu chu are based on those previously reported by Adolph. Fu chu contains much more water (53.68%) than any of the other four types of yuba; common yuba contains only 21.85% and Peking yuba only 9.15%. So it is either fresh or reconstituted.

“In Japan, Kyoto and Nikko are noted for *Yu Ba*. *Yu Ba* is in much demand in China and Japan and is used in numerous ways as an essential ingredient in many very palatable dishes. Its price is high and therefore yuba is used only by the rich.”

Reprinted in 1927 as part of an 86-page monograph titled “The Soybean as Human Food” (Peking, China). Address: M.D., Peking Union Medical College, China.

183. Horvath, A.A. 1927. The soybean as human food. *Chinese Economic Journal* 1(4):415-25. April. [34 footnotes. Eng]

• **Summary:** Contents: Soybean curd (tofu) for food: Preparation and types (“The Chinese classical name for *tofu* is *li chi*, probably meaning ‘the morning prayer’”), historical, present state (of tofu in China), chemical composition, digestibility, utilization (incl. frozen tofu and fried tofu).

Fermented soybean products for food. Soy sauce: Kibiki and sobiki tamari, composition of various soy sauces. Natto. Miso. Conclusion. Bibliography.

Tofu—Historical (p. 416): “The manufacture of soybean

curd (*tofu*) was started in China in 164 B.C., during the reign of the Emperor Han Wen, by a man named Liu An, the duke of Hwai Nan. Liu An was a great friend of the Buddhist monks, and it seems quite probable that he made this bean curd to provide a change or delicacy to break the monotony of the monastic ration (Adolph). *Tofu* was introduced into Japan from Korea for the first time during the Toyotomi government, and Buddhist priests and some other people used it for their daily food among others before it was generally used in Japan.

Tofu—Utilization (p. 418-19): “Both the composition and the digestibility of *tofu*, therefore, prove it to be a very nutritious food material. In the Orient *tofu* forms a very popular and almost indispensable dietary article for the Buddhist priests, as well as the strict adherents to Buddhism, who eat no animal food [i.e., are vegans]. A common saying in some parts of China terms ‘bean milk the poor man’s milk, and bean curd the poor man’s meat.’ *Tofu* is also called ‘the meat without the bones.’

Note: This is the earliest English-language document seen (Dec. 2010) that contains the phrase “the meat without the bones.” Note that it refers to tofu and not to soybeans.

In Indo-China the daily consumption of *tofu* by an adult is about 3/4 of a pound. *Tofu* in its various forms is also used very extensively by all classes of Japanese. In the interior of the country where fish cannot be easily obtained, it is a most important source of protein.

“In the Orient *tofu* is eaten in a fresh condition simply with a little *shoyu*, though it is also frequently cooked in soup. Fried *tofu* is also a very popular article of food. Rape-seed oil, sesame oil or soybean oil are generally used in frying.

“*Tofu* may also be prepared for preservation and transportation. For this purpose fresh *tofu* is cut into smaller pieces and exposed to severe cold weather, to remove the water by freezing, and is then dried in an oven. As thus prepared it can be preserved for several years. When the *tofu* is frozen the water collects in fine needles of ice distributed throughout the mass. When the ice melts and the water runs out, it leaves the *tofu* porous and it may be easily dried. If it is not frozen, it is difficult to dry and the resulting material is dense and horn-like. The *tofu* also cooks very well if cooked in diluted soy sauce and smoked in the same manner as meat. The resulting product forms in the Orient the basis for the manufacture of various ‘artificial meat’ preparations.\*” Footnote: \* “In Germany, the Soyama factory prepared during the Great War [World War I] a meat supplement from soybeans. It was cheaper than beef, contained less carbohydrates and had a nutritive value of about 1500 Calories in 1 kilo.”

“In Peking, at the Kai Cheng Bean Products Company, various preparations manufactured from tofu may be purchased, such as different kinds of soybean meat, soybean sausages, etc. The company has established a restaurant in

Peking (at 86 Morrison Street, the name is written in Chinese characters) where one can get a Chinese dinner of numerous dishes prepared mostly from soybean products (chicken meat, pork, ham and beef, manufactured from *tofu*). Also discusses Dr. Yamei Kin.

A note at the end of this April issue states: "A reprint of Dr. Horvath's paper in booklet form may be obtained from the Bureau of Economic Information. Price \$1, Peking Currency.-Ed." Thus, these six articles were reprinted in 1927 as part of an 86-page monograph titled "The Soybean as Human Food" (Peking, China). Address: M.D., Peking Union Medical College, China.

184. Horvath, A.A. 1927. The soybean as human food. Peking and Shanghai, China: Chinese Government Bureau of Economic Information. Booklet Series No. 3. 86 p. May. Reprinted from Chinese Economic Journal, Sept. and Nov. 1926, and Jan. to April 1927. No index. 21 cm. [38 ref]  
**• Summary:** A very original and important book. Contents: Preface by Macey F. Deming, Tappan New York, from an address at a meeting of the National Soybean Growers', held at Washington, DC, Sept. 1925. Introduction. 1. General ingredients of the various Manchurian beans. 2. Composition of some Japanese soybeans and of the common American varieties. 3. Value of the soybean as food. 4. Soybean oil for food. 5. Refined soybean oil: As substitute for salad or frying oil, as substitute for hardened oil and lard (hydrogenation), in oleomargarine and vegetable butters. 6. Whole soybean as food: Immature or green soybeans, mature or dry soybeans, the digestibility of the boiled soybean seeds, boiled soybeans as a food of predominant importance in China, soybean coffee, soybean chocolate, soybean sprouts.

7. Soybean cake, soybean meal and soybean flour for food: Soybean press cake, soybean extraction meal, soybean flour (Berczeller, Soyama, Aguma, lecithin, Ehrhorn), Sojawurze (Suppenwurze, Maggi cubes), digestibility of soybean flour, value for infants (p. 53, based on the research of Dr. Ruhrah in the USA), some medical aspects of the use of soybean flour, soybean flour in diabetes. 8. Soybean milk for food: Introduction, preparation of soybean milk, properties (incl. inoculation with a culture of yoghurt [yogurt] bacteria to give a curd-like acid mass), market prices, composition, nutritive value, new methods in the manufacture of soybean milk (Prof. Laxa in Prague [Czechoslovakia], Li Yu-ying, Soyama), some dietetical advantages and applications of the soybean milk, condensed soybean milk and milk powder (Soy Lac soybean milk powder made in America by Chard), soybean cake, soybean meal and soybean flour as material for soybean milk, *yu p'i* and *yu ba* (*yuba*; also *fu chu*).

9. Soybean curd (*tofu*) for food: Preparation and types (classical name is *li chi*), historical, present state (of *tofu* in China), chemical composition, digestibility, utilization. 10. Fermented soybean products for food. Soy sauce: Kibiki

and *sobiki tamari*, composition of various soy sauces. Natto. Miso. Conclusion. Bibliography.

On page 9 we read: "An industry which promises to be of importance in a further utilization of the soy bean is the manufacture of 'vegetable milk.' At the present time a factory in New York State is being equipped for this purpose." Address: Peking Union Medical College, China.

185. Yamamoto, Yoshihiko. 1927. Nattô-kin no katarase ni tsuite [The catalase enzyme from natto bacteria]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 4(11):922-39. [31 ref. Jap; ger]  
**• Summary:** The German abstract is titled "Ueber Katalase von Bacillus natto." This laboratory is headed by Dr. Jun Hanzawa. Address: Hokkaido Teikoku Daigaku, Nôgaku-bu (Sapporo), Japan.

186. Yu-niti-ei. 1927. [Enzymes of natto-pilz]. *Chosen Ikai* 75:284-. [Jap]\*

187. Nadkarni, Krishnarao Mangeshrao. ed. and pub. 1927. The Indian materia medica. 2d ed. Bombay, India: K.M. Nadkarni. 5 + xviii + 1142 + clxix + lxxxviii p. Index. 20 cm.

**• Summary:** The body of this book (1142 p.) appears to be titled *The Indian Materia Medica with Ayurvedic, Unami & Home Remedies*. Soybeans are mentioned in three different places, almost as if each was thought to be different plant.

Page 313-14. "305. Dolichos Soja-(English-Soya bean, German-Soja bohne, Bengali-Gari kulaj, Hindi-Bhatwan, Kumaon-Bhut) is a species cultivated in some part of India for its seeds which are eaten and which contain a high percentage of protein and fat."

Page 399: "396. Glycine Soja & G. Hispida are species (English-Soya bean, Hindi-Bhatwan, Bengali-Gari kulaj, Kumaon-Bhut, Eastern Terai-Khajuwa) met with on the tropical Himalayas from Kumaon to Sikkim and Khassia and Naga Hills. A decoction of the root is said to possess astringent properties."

Page 803: "886. Soja Hispida or Glycine Soja (English-Soya bean; Soy-bean) has taken the place of meat in the diet of Chinese, Japanese and other Asiatics. Its notable characteristics are its large proportion of assimilable protein and fat, and its lack of starch and small content of sugar. Being so highly nutritious, it is not adapted for use as a side-dish, like ordinary vegetables, but, like meat, supplies a chief food. Among the preparations mentioned as common in China and Japan are 'tofu' resembling cottage cheese; 'Shoyu or Soya' which has been soaked to remove the skin and then boiled and seasoned; 'Miso' or soy-bean milk, prepared by soaking pulverized beans and straining; and 'Natto' obtained by fermenting the boiled beans. The lack of starch gives the beans favour as a diabetic food, and soy-bean meal and soy-bean bread have been prepared. The beans have been also tried as a coffee substitute-(Popular

Science Siftings). For more particulars see also Dolichos Soja etc.”

Also mentions *Sesamum indicum* (p. 788-90). Sanskrit.—Tila. English—Gingeli. French—Sesame. German—Sesom [Sesam]. Hindi, Cashmeri, Punjabi & Bengali—Til. Mahrathi & Konkani—Teel. Telugu—Nuvvulu; Guvvulu. Tamil—Ellu. Canarese—Uru-Ellu. Malayali—Karuellu.

The author was born in 1864. A 3rd edition was published in 1955. First published in 1908 under the title “Indian Plants and Drugs.” Address: India.

188. Yamamoto, Yoshihiko; Tamura, Yoshisuke. 1928. Nattô seisei-kin ni kansuru kenkyû. I. Ichi nattô-kin no saikin gaku-teki kenkyû [Studies on the natto bacillus. I. Bacteriological studies of *B. natto*]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 5(8):589-609. [20 ref. Jap; eng]

• **Summary:** The English-language summary states: “Our natto bacillus is the one bacillus of the bacilli which produce ‘natto’ from boiled soy-bean. We have examined the details of the bacteriological character of this microorganism and determined the position in the classification of the genus Bacillus, according to Chester’s and Bergey’s manuals (Table d and Table III). Our strain differs from Sawamura’s Bacillus natto in size, spore formation, and H<sub>2</sub>S formation, and differs from Matsumura’s Bacilli in size and gelatine liquefaction or H<sub>2</sub>S formation. The specific name of our bacteria shall be determined in future after our comparative study of the known natto bacilli.” A detailed 3-page description of these rods is given, with a page of illustrations. Address: Institute of Applied Mycology, Faculty of Agriculture, Hokkaido Imperial Univ., Sapporo, Japan (Hokkaido Teikoku Daigaku, Nôgaku-bu (Sapporo), Japan).

189. Grey, Egerton Charles. 1928. The food of Japan. Geneva: League of Nations, Health Organization. 161 p. May. Index. 22 cm. [82 ref. Eng; fre]

• **Summary:** Detailed information and analysis. Contents: Preface. 1. Quantity of food in Japan: Exports, imports, production and consumption of food in Japan in the year 1925. 2. Quality of food in Japan: Definition of quality. 3. Distribution of food in Japan: Natural and artificial distribution. 4. Chemical composition of Japanese foods as consumed: Methods of analysis. 5. Chemical composition of Japanese food as purchased. Appendices: I. Literature relating to the chemical and physical properties of the food of Japan, with list of authors. II. Food materials and the plants and animals serving as sources of food in Japan.

Table 7 (p. 25) shows the amounts of major foods consumed in Japan. The percentage of the total food consumed is: Rice 50.83%, barley 10.15%, potatoes 8.63%, wheat 6.63%, soy bean 4.76%, other beans 3.71%, other cereals 3.24%, fish 1.72%, seaweed 1.23%.

On page 54, the author discusses the “Alkalinity of the ash [of foods]. This figure is of considerable importance as

indicating the capacity of the food material to produce alkali in the body.” On pages 61-111 the author lists the nutritional composition of all major Japanese foods, grouped by food type: 1. Cereals and cereal products. 2. Legumes, pulses, and legume products. 3. Roots, greens, and other vegetables. 4. Mushrooms and seaweeds. 5. Fruits, nuts, and seeds. 6. Vegetable oils. 7. Other vegetable products. 8. Dairy products. 9. Eggs. 10. Meat and animal fat. 11. Fish. 12. Condiments, beverages, etc. The name of each food is given in both English and French, usually with a brief explanation.

In a table (p. 65-69), in category “II. Legumes, pulses, and legume products,” the section titled “Fresh legumes” includes (p. 64-65): Edamame (Soy bean in pod) = *Fève de soya en cosse*. The section titled “Dry legumes (pulses)” includes (p. 64-67): Azuki (Small red bean) = *Petit haricot rouge*. Dainagon (Small red bean) = *Petit haricot rouge* Ao daizu (Soy bean [with green seed coat]) = *Fève de soya*. Kuro daizu (Black soy bean) = *Fève de soya noire*. Shiro Daizu (White soy bean) = *Fève de soya blanche*. Rakkasei (Pea nut) = *Pistache de terre*.

The section titled “Bean products” includes (p. 66-69): Aburage (Fried-bean curd) = *Pâte de haricots frite*. Aka miso (Soy-bean paste) = *Pâte de fèves de soya*. Gammodoki (Fried-bean curd) = *Pâte de haricots frite avec mixture d’algues marines*. Kinako (Soy-bean powder) = *Poudre de fèves de soya*. Kori tofu = *Pâte de haricots séchée*. Namaage (Fried-bean curd) = *Pâte de haricots frite*. Natto (Fermented soy bean) = *Fève de soya fermentée*. Sarashian (Red-bean powder) = *Poudre de haricot rouge* [Sarashi-an from azuki beans]. Shiro miso (White soy-bean paste) = *Pâte blanche de fève de soya*. Tofu (Soy-bean curd) = *Pâte de fèves de soya*. Tofu kasu (Soy-bean residue) [okara] = *Déchets de fèves de soya*. To nyu (Soy-bean milk) = *Lait de fève de soya*. Yuba.

Note 1. This is the earliest English-language document seen (June 2011) that uses the word *gammodoki* to refer to deep-fried tofu burgers, or that uses the word *namaage* to refer to deep-fried tofu cutlets.

Also: Mushrooms and seaweeds includes (p. 73-75): Arame, Asakusanori [Asakusa nori], aonori, hijiki, kanten, kombu, mozuku, ogonori, tororo kombu, wakame. Fruits, nuts and seeds includes (p. 77): Asanomi (Hemp seed), Goma (sesame, white and black). Vegetable oils includes (p. 79): Daizu yu (Soy bean oil) = *Huile de fève de soya*.

Condiments includes (p. 92-93): Hamana natto [fermented black soybeans]. Kiriboshi (Dried daikon). Misozuke [miso pickles]. Narazuke. Shoyu [soy sauce]. Takuan (Pickled radish). Umeboshi (pickled plum) = *Prune confite*. Beverages includes (p. 92-93): Amazake. Mirin (fermented rice). Sake (Rice wine).

For each food, the following values are given in both English and French: Water, protein (N x 6.25), fat, carbohydrate, ash, calories, alkali value, total nitrogen, water-soluble nitrogen, phosphoric acid (anhydrous), sodium chloride (salt), water-soluble ash, water-insoluble ash,

alkalinity due to soda and potash, alkalinity due to lime and magnesia, calcium oxide, ferric oxide, factor for converting to dry food.

Note 2. In Japan, the typical person is well aware of which foods are alkaline (*arukari-sei*) and which are acidic (*san-sei*). The alkaline foods are generally considered more healthful and health-protecting. For the alkaline values given by Grey for many basic Japanese foods, see SoyaScan Notes. 1991. Sept. 20.

Note 3. This is the earliest English-language document seen (March 2009) that uses the term “soy-bean paste” to refer to miso.

Note 4. This is the earliest English-language document seen (June 2009) that uses the term “Edamame” to refer to [green] soy beans in their pods.

Note 5. This is the earliest English-language document seen (Feb. 2004) that uses the term “kori dofu” to refer to dried-frozen tofu.

Note 6. This is the earliest English-language document seen (Dec. 2006) that uses the term “pickled plum” to refer to umeboshi salt plums.

Note 7. This is the earliest English-language document seen (Nov. 2011) that uses the term “Hamana natto” to refer to fermented black soybeans.

190. Yamamoto, Yoshihiko. 1928. Nattô seisei-kin ni kansuru kenkyû. III. Gerachin ekika-ryoku ni tsuite [Studies on natto microorganisms. III. On the liquification power of gelatin]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 5(11):819-26. [9 ref. Jap]  
Address: Hokkaido Teikoku Daigaku, Nôgaku-bu (Sapporo), Japan.

191. Dyson, G. Malcolm. 1928. Mould food of the Far East. *Pharmaceutical J. and Pharmacist (London)* 121:375-77. Oct. 20.

• **Summary:** Discusses *Aspergillus* molds, soya sauce or shoyu, shoyu-koji, tane-koji, the shoyu-yeast (a strain of *Zygosaccharomyces*), the sodium salt of glutamic acid (which imparts a meat-like flavor to these purely vegetable preparations), *aji-no-moto*, red miso and white miso (*shiomiso*), natto, the protein-splitting powers of the enzymes secreted by the molds mentioned above.

Red soya cheese is a type of tofu. The ripened curd is immersed in a brine and the maturing is finished by a purple mold—*Monascus purpureus* (Went.)—which imparts a red color to the finished tofu.

Note: This is the earliest English-language document seen (Oct. 2011) that uses the term “Red soya cheese” to refer to fermented tofu. Address: Ph.D., A.I.C.

192. Dorsett, P.H.; Morse, W.J. 1928. Agricultural explorations in Japan, Chosen (Korea), Northeastern China, Taiwan (Formosa), Singapore, Java, Sumatra and Ceylon

(Log—unpublished). Washington, DC: USDA Bureau of Plant Industry. Foreign Plant Introduction and Forage Crop Investigations. 8,818 p. Unpublished typescript log. Illust. Partially indexed. 28 cm.

• **Summary:** Also called the “Log of the Dorsett Morse Expedition to East Asia” and (by the National Archives) “Dorsett-Morse Expedition to the Far East, 1929-31,” this is one of the most important documents ever produced on soybeans and soyfoods. Covering the period from late 1928 until 1932, it consists of 17 volumes of typewritten unpublished manuscript plus handwritten notebooks.

The two explorers, who were gone on the expedition for a little more than two years, initially planned to be gone for about three years. They took 3,369 photos of which 95% appear in the report; the original prints are pasted on the pages, each with a number and a caption. The first negative number is #43196 (p. 238) and the last is #46514. The last numbered page of the report is #8818, but most of the index pages are not numbered and some special reports at the end of the main report each start with page 1.

The first quarter of the pages (to about page 2,500) are indexed, using 4 separate indexes. The only original and 2 microfilm copies were at the American Soybean Assoc. (St. Louis, Missouri), however as of Aug. 2011 they are on permanent loan to Rare and Special Collections at the National Agricultural Library (Beltsville, Maryland)—which also has 7 photograph albums that accompany the 7 log books. A list of the missing pages has been compiled. One photocopy of a microfilm copy is at the Soyinfo Center (Lafayette, California). One microfilm copy is at the National Archives in Washington, DC, in Records of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Record Group 54. See: “National Archives Microfilm Publication No. M840. Expedition Reports of the Office of Foreign Seed and Plant Introduction of the Department of Agriculture, 1900–1938.” Rolls 16-20, volumes 56-73. These microfilm rolls may also be available for viewing or duplication at one of the various regional branches of the National Archives (e.g. San Bruno, California).

A brief itinerary of the trip is as follows: 1929 Feb. 18—The party of 5 people leaves Washington, DC, for Los Angeles by train. It consists of Morse, his wife Edna, their daughter Margaret (age 7), Dorsett, and his daughter-in-law Ruth (Bobbie; the widow of Dorsett’s son, she served as Dorsett’s secretary and general helper).

March 1—They sail from San Francisco to Yokohama on the S.S. *President Grant* of the Dollar Steamship Lines. March 29—Arrive in Yokohama, proceed directly to Tokyo, establish headquarters with rooms at the Imperial Hotel, and hire an interpreter, Mr. Suyetake, who works with them for the next 2 years. May 21—The Morses go to Hokkaido, the Dorsetts to Kyoto, by sleeper train. Morse returns to Tokyo.

Aug. 17—The entire party arrives in Hokkaido and establishes headquarters in Sapporo to study soybeans.

Oct. 8—Leave Hokkaido for the Northeast Provinces, then arrive in Tokyo on Oct. 15. Oct. 22—Arrive in Keijo (Seoul), Korea, then take many side trips. Note: 1929 Oct. 29—Great Depression begins in USA with stock market crash. Dec. 8—Return to Japan via Kyushu, then to Tokyo to study soyfoods. They buy and photograph many!

1930 April 1—Travel by steamer to Dairen, Manchuria, where they set up headquarters. Dorsett very sick from April 11 to June 11; taken to a Japanese hospital in Dairen, he almost dies of double pneumonia. Morse does the work of both men and does not inform USDA of Dorsett's critical condition. June 24—Morse takes a quick trip to northern Korea, via Mukden and Antung (Tan-Tung), to look for *Zoysia* grass.

July 1—Returns to Manchuria via Mukden. July 21. Dorsetts leave for Peking by train; Morses and Mr. Suyetake stay in Dairen. Aug. 21—Morse party travels to northern Korea, staying in Heijo (Pyongyang / P'yongyang); takes a 4-day side trip to Seoul. Sept. 28—Morse returns to Dairen, Manchuria.

Oct. 19—Morse party leaves Dairen, arriving in Peking the next day. Nov. 9—Morse party returns to Dairen. Nov. 30—Morse arrives in Harbin, north Manchuria, then passing through Mukden, returns to Dairen. Dec. 18—Morses leave Dairen for Japan, passing through Kobe on Dec. 21 and arrive in Tokyo on Dec. 23.

1931 Jan. 12—Travel to Kyoto, Himeiji, and Tatsuno Shoyu. Jan. 16—Visit Okazaki and Hatcho miso. Jan. 17—Return to Tokyo. Feb. 17—Morse party leaves Tokyo by boat for the USA, arriving in San Francisco on March 4. March 15—Dorsett party leaves Peking for Tientsin, Shanghai, and Hankow. March 27. Dorsetts sail from Shanghai to San Francisco.

Note 1. The title of this report is puzzling since the expedition never went to Taiwan, Singapore, Java, Sumatra, or Ceylon. It was proposed several times that they visit these places, but the plans did not work out.

Note 2. This is the earliest log (unpublished) seen (Oct. 2001) that mentions soy. Address: Agricultural Explorers, USDA, Washington, DC.

193. Yamamoto, Yoshihiko; Tamura, Yoshisuke. 1928. *Nattô no saikingaku-teki kenkyû. II. Nattô-kin hôshi no yakuhin narabini netsu ni taisuru teikôsei* [Studies on natto microorganisms. II. On the resistance of natto bacteria spore to drugs and heat]. *Sapporo Norin Gakkaiho (J. of the Society of Agriculture and Forestry, Sapporo)* 19(86):327-29. [Jap]

• **Summary:** A bacillus was isolated from natto but no name was assigned to it. It was related to bacilli isolated by previous researchers, but it differed in spore formation, H.S. formation, and size from Sawamura's *Bacillus natto*.

194. Hanzawa, Jun. 1928. *Nattô seizô-hô* [Natto production

methods]. Sapporo, Hokkaido, Japan: Sapporo Nattô Yôki Kairyô-kai. 178 p. 19 cm. [Jap]\*

• **Summary:** Jun Hanzawa was born in 1879. Note: This is the earliest book in WorldCat / OCLC that has natto as a subject or title word. Address: Sapporo, Japan.

195. Dorsett, P.H.; Morse, W.J. 1929. Tofu and other soybean products in Japan (Document part). In: P.H. Dorsett and W.J. Morse. 1928-1932. *Agricultural Explorations in Japan, Chosen (Korea), Northeastern China, Taiwan (Formosa), Singapore, Java, Sumatra and Ceylon*. Washington, DC: USDA Bureau of Plant Industry, Foreign Plant Introduction and Forage Crop Investigations. 8,818 p. Unpublished log.

• **Summary:** Page 1051, 1056 (16 May 1929). Tokyo, Japan. A photo shows: "Nearly natural sized picture of a package of dried bean curd or tofu. Native name is 'Koya tofu.' The fresh bean curd is first frozen and then dried. This dried form of curd is used in general cooking with vegetables and meats." The front label on the rectangular package is attractive (neg. #43661).

Page 1057. A photo shows: "Section of a large bamboo culm [the round, hollow stem] which has been transformed into a package for holding (for sale commercially) vegetable pickles. The handle is of kudzu vine. The stopper is of cedar [*hinoki*], *Cryptomeria japonica* (neg. #43662).

Page 1059. "Slightly larger than natural sized picture [photo] of a package of roasted soybeans imbedded in very small rice flour cakes. Beside the package are some of the beans in the rice cakes. This article of food is known as 'Mame taro' [as written on the label]. The skin of the bean is dyed green. These are eaten as confections and may be had at all confectionary stores" (neg. #43664).

Page 1060. "Natural sized picture of rice flour cakes in which are imbedded small black seeded soybeans. Native name is 'Mameiri abura age kaki mochi.' Meaning roasted beans on fried rice cakes" (neg. #43665).

Page 1064. Two packages of mungbean noodles or vermicelli obtained from the Matsuzakaya Department Store. The vermicelli is known in Japanese as 'Tomen'" [sic, Harusame] (neg. #43669).

Page 1065. "Natural sized picture [photo] of a sample of sugared soybeans (native name 'Sato Daidzu') and of a sample of roasted soybeans (native name 'Nori-mame' or daidzu) over which, during the last stage of roasting, finely cut [nori] seaweed is scattered. Both products are used as confections and are to be had at all confectionary stores" (neg. #43670).

Page 1067. "Natural sized picture of roasted soy beans imbedded in very small rice flour cakes. The skins of the beans are dyed green" (neg. #43672).

Pages 1201-02 (26 May 1929). While visiting the Hokkaido Agricultural Experiment Station at Kotoni, Sapporo, Mr. Morse notes: "The soybeans grown in Hokkaido are used entirely for food purposes, such as natto,



bean curd, green vegetable bean, soy sauce, miso, bean paste and roasted beans.” Address: Agricultural Explorers, USDA, Washington, DC.

196. Dorsett, P.H.; Morse, W.J. 1929. Natto in Japan (Document part). In: P.H. Dorsett and W.J. Morse. 1928-1932. Agricultural Explorations in Japan, Chosen (Korea), Northeastern China, Taiwan (Formosa), Singapore, Java, Sumatra and Ceylon. Washington, DC: USDA Bureau of Plant Industry, Foreign Plant Introduction and Forage Crop Investigations. 8,818 p. Unpublished log.

• **Summary:** Page 1179 and 1180 (25 May 1929). Sapporo, Japan. “Copied from Mr. Morse’s diary:...” “After our visit with Dr. Ito we went to the Natto Laboratory of which Dr. [Jun] Hanzawa is in charge. We were given bulletins regarding the history, making and varieties of Natto, and served bottles of different sizes of Nattokin [Natto bacteria] (liquid pure culture) for the making of different kinds of Natto. We were then shown the various forms of Natto and taken through the various rooms and given detailed information on the various steps involved in the production of natto.”

Page 1202 (26 May 1929). Sapporo, Japan. Mr. Morse visited the Hokkaido Agricultural Experiment Station at Kotoni. Mr. Takatsugo Abiko explained that “The soybeans

grown in Hokkaido are used entirely for food purposes such as Natto, bean curd, green vegetable bean, soy sauce, miso, bean paste and roasted beans.”

Pages 2003 and 2004 (29 July 1929). A letter from Mr. Ryerson dated 3 June 1929 noted that at least some of the colored motion pictures were good. “He wrote as follows: ‘The last material received from Vitacolor was a great improvement. The azalea scenes were gorgeous.’”

“We were deeply grieved to note in the same letter the following paragraph concerning Dr. Galloway: ‘Dr. Galloway has had to give up and go home. He will be leaving for a cooler section within a week. His nerves have gone back on him and he is facing the same siege that he had 10 years ago, much to the regret of all of us.’”

Mr. Morse added: “A visit was first made to the Saitama Experiment Station located at Urawa, Saitama Prefecture. We met here Mr. Tadashi Hashigawa, Agricultural Engineer, who is in charge of the soybean work of the Saitama Prefecture, which is the third in acreage of soybeans in the Japanese Empire. The work with soybeans consists mainly of developing varieties for seed to be used in making soy sauce, tofu, miso, and natto. This station is growing about 50 varieties nearly all yellow-seeded sorts with seed of medium size. In looking over these varieties in the trial grounds we found some very excellent varieties that no doubt will have

value in the United States from southern Virginia southward. Especially North Carolina, Tennessee, and the upper delta of Mississippi. Mr. Hashigawa promised to send us samples of seed of all the varieties being grown at the station.”

Page 3341 (24 Dec. 1929). “Today Morse and Suyetake went to call upon soy sauce and natto manufacturers for the purpose of getting acquainted and also if possible arrange for getting still and motion pictures of their plants, equipment and operations.”

Page 3479 (8 Jan. 1930). Tokyo, Japan. *Soja max.* soybean. Photo of: “Three specimens of ‘String Natto’ [itohiki natto], one package (made of rice straw) unopened; one opened; and the natto without the package (see previous page, top). These were purchased at a Natto factory, Tokyo, Jan. 6, 1930. The [rice-straw] packages are 15 inches long and 2½ inches wide. String natto is eaten after having mixed it with a mustard paste” (neg. #44739).

Note: This is the earliest English-language document seen (Jan. 2012) that uses the term “String Natto” to refer to natto or *itohiki natto*, or that uses the word “string” in connection with natto.

Pages 3925, 3929 (18 Feb. 1930). “It is one year ago today since we left Washington for Japan... We have found much of interest in connection with our special line of work, much more even than we expected, and therefore the time has passed all too quickly...”

“Morse and Suyetake searched for soybean products today, and were successful in bringing in a collection of two dozen things slightly or entirely different from those previously secured.”

Page 3929. Photo shows: “Small triangular packages, one as purchased, the other unwrapped. They contain string Natto. The native name is ‘Hygienic Miyako Natto.’ There is at one side a small triangular paper containing dried mustard; this is inclosed [sic] with the Natto. Purchased in Tokyo, Feb. 16, 1930. Soybean dish measures 3 inches across” (neg. #44937).

Pages 6822-23 (22 Dec. 1930). Kyoto, Japan. Mr. Morse’s notes. At the Imperial Agricultural College they met Isawo Namikawa, Professor of Horticulture, who said that Kyoto is noted for several special soy products such as white miso, soy sauce, and natto.

Page 6937 (10 Jan. 1931). Tokyo. Notes by Mr. Morse. Spent most of the day in the Shinjuku district looking up soybean products. “More String Natto in rice straw packages was observed in this section than any we have visited.” Address: Agricultural Explorers, USDA, Washington, DC.

197. Morse, W.J. 1929. Letter from Dr. [sic] Morse. Tokyo, Japan, July 20, 1929. *Proceedings of the American Soybean Association* 2:50-52. Tenth annual field meeting. Held 22-23 Aug. at Guelph, Ontario, Canada.

• **Summary:** This letter from W.J. Morse was read before the 1929 convention of the American Soybean Association

at Guelph, Ontario, Canada. This is the first annual ASA meeting he has missed. He begins with a brief description of the “Oriental Agricultural Exploration Expedition” headed by Mr. P.H. Dorsett and himself. They plan to study soybeans in Japan first. “The largest soybean section is the Island of Hokkaido which has an acreage of 215,212 [planted to soybeans] and produces 3,184,245 bushels of beans” [yield = 14.8 bushels/acre].

“On our arrival and after establishing headquarters in Tokyo, we first began to look up varieties which we might send back to the United States for the 1929 planting. We succeeded in packing up about 100 lots which are now growing in the variety plots at Arlington Farm [Virginia]. In hunting out this seed, we were very much surprised to find the soybeans listed with the garden beans and as garden beans. For the most part these are grown as green vegetable beans. These sorts are black, brown, greenish yellow, and yellow seeded varieties of early, medium, and late types. Some of the yellow seeded varieties are listed as most suitable for bean curd, soy sauce, miso, natto, and confectionery purposes, such as sweet bean paste, candied beans, roasted beans (like our peanuts), and sugared beans.” Note: Azuki beans, rather than soybeans, are usually used to make “sweet bean paste” in Japan.

“It is amazing, the extent to which the soybean is used for food in Japan. Whether or not it can be used in the United States in all of the ways used here is extremely doubtful, that is for human food.” There is no doubt that American soybeans will be used mostly to produce oil and oil meal. “It may interest you to know that the beans produced in Japan are used entirely for human food, green manure, and planting purposes. The grain varieties have seed of higher quality than those produced in Manchuria and are not used for oil and oil meal production as [are] the beans of Manchuria. The great soybean oil and meal production of the Orient is confined almost entirely to Manchuria.

“Another thing which surprised us greatly was the extent to which soybeans are used for green manure purposes in the rice paddies.” The plants are turned under in the mud after water has been run into the paddies.

“Another extensive use of the soybean is for bean curd, or tofu, which is manufactured only... in small shops scattered about the cities and country villages. This curd is used in many ways, being the meat of the poorer classes. It is used, however, quite generally in making bean-curd soup [miso soup with tofu] which is sometimes served at breakfast and nearly always at supper. The bean curd is peddled about from house to house by men with two tubs suspended from a bamboo pole over their shoulders. The sound of the little horn of the bean curd man as he announces his coming has become quite a familiar sound to our ears as we go along the streets or hear him pass under our office windows.

“Soy sauce is manufactured on a very large scale and is universally used by the Japanese, rich and poor. We have



had the pleasure of visiting the large experimental laboratory of an experiment station given wholly to soy sauce and saké experiments. In Hokkaido we visited a soy sauce factory, the buildings of which covered several acres. In one of the curing vat buildings where the mash is allowed to cure for about 18 months, we counted ninety large vats.

“Soybeans are used to a very considerable extent for confectionery purposes. The large black, brown, and green seeded varieties are used in making sweet bean paste which is put up in small thin slabs and then done up in very attractive packages. Roasted beans, similar to our roasted peanuts, may be found at nearly all confectionery stores. Roasted beans are also sugar coated and others are sprinkled with small pieces of sea-weed during the roasting, which gives an appearance of mottled beans (rather a familiar sight to our mid-west farmers). Then, there are the candied beans, that is, beans which have been boiled in syrup.

“Miso and natto are two forms of bean foods in which the beans are first cooked and then treated with certain bacteria [sic, microorganisms]. Miso is used largely in soups which are consumed at breakfast. Both of these foods are quite largely used.

“Other products used for food are roasted soybean flour, soybean vermicelli, pickled green beans in the pod, yuba—the film produced by boiling soybean milk, and dried frozen bean curd.” Note 1. This is the earliest English-language document seen (Feb. 2004) that uses the term “dried frozen bean curd” to refer to dried-frozen tofu.

Note 2. This is the earliest English-language document seen (Dec. 2005) that contains the term “roasted soybean flour.”

“Another surprising thing is the very extensive use of the soybean as a green vegetable bean. As early as May, small bundles of plants with full grown pods were seen on the market. At the present time the market is virtually flooded with bundles of plants with full grown pods, the seeds of which are also full grown. The pods are boiled in salt water and the beans eaten from the pods.

“During the past two weeks we have visited large sections near Tokyo where soybeans are grown for green vegetable purposes. The beans are grown in rows 2 feet apart and in 95 per cent of the cases there are other crops planted between the bean rows, such as early cabbage, onions, lilies (for the edible bulbs), late varieties of soybeans, late plantings of soybeans, and other early truck crops.” Address: USDA, Washington, DC.

198. Dorsett, P.H.; Morse, W.J. 1929. Natto and soybeans in Chosen [Korea] (Document part). In: P.H. Dorsett and W.J. Morse. 1928-1932. Agricultural Explorations in Japan, Chosen (Korea), Northeastern China, Taiwan (Formosa), Singapore, Java, Sumatra and Ceylon. Washington, DC: USDA Bureau of Plant Industry, Foreign Plant Introduction and Forage Crop Investigations. 8,818 p. Unpublished log.

• **Summary:** Page 3015 (20 Nov. 1929). In Keijo [Seoul], Chosen. After sending off four parcel post packages, the authors “went to The Natto Co., 55 Nichome, Yoshino Cho, Keijo, and arranged for making snap and motion pictures of the various operations incident to the manufacture of this interesting food product.”

The building is a rather low one-story structure with the cooker and fermenting room or chamber built inside the one-room building. There are shelves 18 inches or 2 feet below the ceiling and upon these the prepared rice straw packages of boiled beans are placed to cure or for the development of the bacterial germs.

“The beans are first soaked for about half a day and then boiled slowly for 7 to 9 hours. After the proper amount of cooking the beans (in a small amount, about a double handful) are placed in rice straw containers. They are then put into the culture chamber where they remain for 20 to 24 hours at a temperature of 40° to 45° F.

“This curing or culture room is heated and the above noted temperature maintained by means of charcoal fire pots.

Page 3016 shows a floor plan of the factory with ten areas labeled in detail.

Page 3017. “We learned that there is a liquid residue from the cooking which is rich in soluble proteins and other valuable food constituents of the soybean. The owners have been trying to find a practical use for this by-product. They have utilized it in the sizing of dough in place of water or milk with fairly good results. They also tried to make a bean candy by adding sugar, but rather a poor product was obtained. A table compares the composition and food value of 75 gm of natto compared with beef. Natto contains 19.3% protein, 8.2% fat, 6.1% carbohydrates, 180 calories, and a cost of 0.03 sen (vs. 0.12 sen for beef).

Page 3018-3021. Photos show: (1-2) “Filling natto into the rice straw containers” (two views). (3-4) “Selecting rice straw for making into rice straw containers.” (5) “Making natto containers of rice straw.” (6) “From left to right are as follows (in a row on a table): 1. Selected rice straw; 2.





holder before trimming; 3. holder after trimming; 4. holder open ready for filling. 5. filled. 6. trimmed, ready to use. (7) Trimming natto containers of rice straw. (negatives #44603-09).

Page 3043 and 3044 (21 Nov. 1929). "About 9:30 this morning we took our cameras and went to a Natto factory, Shuji Kamiga, at 72 Kantetsudo, Keijo, Chosen, to get information about the making of this soybean product. and also to try and get still and motion pictures of at least some of the operations as well as supplies utilized in connection with the handling and marketing of this product." They "secured a lot of information and made several motion picture shots and tried a lot of still pictures, both of which we trust will turn out to be good." Later that day they "visited several markets and picked up some samples of seed of soybeans and other crops.

"Today we got our Field Trip Report for the quarter September 1 to October 31 packed up for shipment via parcel post to Washington, D.C." A photo (p. 3045) shows a metal pan piled high with round white "Balls of the refuse after making Tofu" [okara] (neg. #44610).

Pages 3046 to 3049. Photos show: (1) (1) Bundles of natto containers at the Shuji Kamiga Natto Factory. (2)

Trimming natto containers and preparing the packages for market. (3) Trimming and packing natto packages. (4-5) Making rice straw containers for natto. (6-7) "A nearby view from left to right: (in a row against a white background): 1. Selected rice straw; 2. made package container; 3. open container ready to be filled; 4. container filled but not closed; 5. container filled and closed; 6. container filled and trimmed; 7. trimmed and labeled; 8. open ready to eat. 9. wooden box of natto closed. 10. wooden box container of natto open. (8) A grain merchant's display of small grain, in baskets, in the market (negs. #44613-20).

Page 3074. In Seihyaku, near Keijo, workers transporting sacks of soybeans from a river junk to a storage house several thousand feet away.

Page 3130. In Genzan, Chosen. Photo of "Grading and cleaning soybeans" (neg. #44649).

Page 3179. In Tansen, Chosen. Two photos of men standing around stacked soybeans. "Within the court of a Korean farmer's place, W.J. Morse on extreme left, Suyetake next, beyond them a stack of soybeans, to the right Koreans" (neg. #44654-55).

Page 3181. In Tansen, Chosen. Photo of "A Korean farmer's front yard. Mr. Morse and Suyetake arranging for samples of soybeans" (neg. #44658). Address: Agricultural Explorers, USDA, Washington, DC.

199. Muto, M. 1929. Nattô no saikingakuteki kenkyû [Bacteriological research on natto]. *Eisei Densen Byogaku Zasshi (J. of Hygiene and Infectious Diseases)* 25:708-46. [Jap]\*

200. Ferrée, Christian Johan; Tussaud, J.T. 1929. The soya bean and the new soya flour. London: William Heinemann (Medical Books) Ltd. xi + 79 p. Illust. No index. 22 cm. Revised translation from the Dutch by C.J. Ferree and J.T. Tussaud of Die Sojaboon en Duurzaam Sojameel. [29 ref] • **Summary:** Contents: Foreword, by Sir Wm. Arbuthnot Lane, President of The New Health Society. Preface, by C.J. Ferrée (London). 1. Introduction. Literature. Name of the plant. Origin. Botanical particulars. Assimilative power of the soya plant. Inoculation. Soil requirements. Production and cost. 2. General ingredients of the various Manchurian beans. Composition. The value of soya protein. Vitamin in the soya bean. Digestibility of the soya bean and its products. 3. Use in China and Japan: Bean sauce, soy, or shoyu, Chinese chiang (paste), tou-fu or beancurd, beans consumed as a table vegetable, bean refuse and bean cake are used as a fertiliser and for fattening hogs, bean oil is used as an illuminant (where it has not been superseded by kerosene), as a substitute for lard in cooking, and as a lubricant for greasing axles and parts of native machinery, miso and natto. First imports into Europe. Exports during the last five years from China and Japan. Imports during the last five years into Europe and America. The increasing rate of its cultivation.

Manchuria—Production. Estimate of the world's production of the soya bean. London the principal market. Future importance.

4. America. Australia. South Africa. Other British possessions and protectorates. Java (Dutch East Indies). Europe. 5. Unsuccessful experiments with soya flour. Ordinary soya flour. Extracted soya flour. Dr. L. Berczeller's discovery. The new soya flour. Comparison with other cereal flour and other foods. Comparison in price with other cereal flour and other foods. Comparison in price of soya protein compared with other cereal foods. Comparative analysis of cereals. 6. Soya milk. Vegetable casein. Lecithin. 7. Increase in food value. Savings. Industrial application in foodstuffs. The importance of Dr. L. Berczeller's soya flour for the food industry. Soya flour and the food laws. Uses of soya flour in: Bread, pastry, cake, biscuits, confectionery, sausages, infant foods and food for invalids, cocoa, chocolate, soup cubes, pudding flour. Uses in the kitchen. Soya flour recipes (for flour made using the Berczeller process), soya flour for diabetics, recipes for diabetics.

The Preface states: "In the following pages the writer has endeavoured to give an account of the numerous uses to which the soya bean has so far been put, and to visualise its future service to humanity through the means of a totally new and practical process by which this legume... may in future be used as an important article of food for general consumption throughout every quarter of the globe.

"In compiling the details relative to the soya bean flour, with which this brief summary principally deals, he trusts that he has succeeded in giving sufficient data to enable the reader to fully realise its value as a staple food from the economic point of view, as well as from the more domestic standpoint, so that the important fact may be fully realised that a new foodstuff of a very valuable nature... has now been brought within the reach of all nations to serve them in a most practical manner as an economic article of food."

The book includes statistics on the imports and exports from 1923 to 1927 of "soya beans, soya oil, and soya cake in various countries including China, Japan, England, France, Germany, Holland, Norway, Denmark, Sweden, and USA.

The "new soya flour" is that developed by Dr. Berczeller. This book repeatedly praises that flour. "A few years ago Dr. Laszlo Berczeller, a Hungarian physiologist in Vienna, succeeded scientifically in finding a method which enables us to prepare from the soya bean a digestible and pleasantly flavoured flour without detracting from its nutritive value, and this method entirely succeeds in preserving all the good qualities contained in the bean itself. Physiological experts and analysts withhold no praise, as the following extracts will show:—" There follow words of praise from: (1) Dr. Alfred Schwicker, M.P., Royal Hungarian State Institute, Central Depot for Experimental Chemistry. (2) Dr. Stefan Weisser, King's Counsellor, Royal Veterinary Physiological Experimental Station, Budapest. (3) Prof. A.

Durig., The Physiological Institute, University of Vienna.

Marakujew (1928) estimates the production of soya beans in "Manchuria at 6 million tons at the utmost, the production of the whole of China at 16 million tons, and he is led to this figure by the conclusions of the Economic Bureau of the South Manchuria Railway, which estimates that the Manchurian crop in 1927 amounted to 37.1 million koku (5.88 million English tons), of which 2.6 million tons originated from South Manchuria, 3.3 million tons from North Manchuria" (p. 32). A table (p. 33) gives estimated world production of soya beans from 1923 to 1929 (6.6 million tons, forecast). The leading producers in 1929 (in million tons) are: China 5.250. Japan 0.580. USA 0.250. Java and Dutch East Indies 0.120. Other Asiatic countries 0.400. A soya milk factory was recently established in Denmark (p. 54). Although this book contains a bibliography of 29 references, most are very incomplete.

Photos show: (1) A soybean plant with roots, pods, and leaves. (4) Nodules growing on soybean roots. (5) One pod and seed each from inoculated and uninoculated soybean plants. (7) An immense field of soya beans in Manchuria. (8) Soya beans awaiting shipment, in house-shaped stacks under tarps, at Dairen. (13) Seeds of the most important varieties of soya beans now grown in the United States. (10) Two horses and a farmer cultivating a field of soybeans. (11) Harvesting soya beans. (12) Well selected, clean soybean seeds.

A map (frontispiece) shows where soybeans are cultivated worldwide. An illustration (facing p. 2) shows "Shen-Nung. Emperor [of China] in 2838 Before Christ, called 'The Heavenly Farmer.' Reproduced from a print in a Vienna museum."

One bar chart compares the nutritional composition of soya flour with that of cereals and animal products, and other foodstuffs (p. 13), another compares the calories (p. 46), and a third compares the cost of 1,000 calories (p. 48). Marakujew (probably spelled Marakiev or Marakuyev), in "The Export of Manchurian Soya Beans and its Finance" (1928, in Russian, probably an article rather than a book) "estimates the production of Manchuria at 6 million tons at the utmost, the production of the whole of China at 16 million tons, and he is led to this conclusion by the Economic Bureau of the South Manchuria Railway, which estimates that the Manchurian crop in 1927 amounted to 37.1 million koku (5.88 million English tons), of which 2.6 million tons originated from South Manchuria, 3.3 million tons from North Manchuria. According to the calculations of this bureau, the home consumption of North Manchuria is something like 40 of the production, viz., 1.3 million tons; the remaining 2 million tons are for export. The exports of South Manchuria were estimated at 1 million tons" (p. 32). Address: London.

201. Sprecher von Bernegg, Andreas. 1929. *Tropische und subtropische Weltwirtschaftspflanzen; ihre Geschichte,*

Kultur und volkswirtschaftliche Bedeutung. II. Teil: Oelpflanzen [Tropical and subtropical plants in international commerce; their history, cultivation, and economic significance. Vol. II. Oilseeds]. Stuttgart: Verlag von Ferdinand Enke. See vol. 2, p. 128-70. Illust. Index. 25 cm. [48 ref. Ger]

• **Summary:** The soybean (p. 128-70). Contents: Introduction. Name, place of origin and history. Description of the plant: Systematic, morphology, varieties, selection. General conditions for growth: Climate, soil. Cultivation of the plant: Planting, care. Harvest and storage. Composition and products. Utilization: As a fodder plant, as a coffee substitute, industrial non-food uses, as a food (as a green vegetable, soy sprouts, soy chocolate, soymilk, casein, tofu and soybean quark {*tofu oder Sojabohnenquark*}, natto {*Buddhistenkäse*}, hamananatto, yuba, miso, shoyu or soy sauce {*Sojasauce*}). Production and trade.

Concerning green vegetable soybeans, the author states: “Three-quarter ripe soybean seeds yield a good, green vegetable (*Dreiviertelreife Sojabohnen geben ein gutes, grünes Gemüse*).” Address: PhD, Titularprofessor an der Eidgenössischen Technischen Hochschule, Zurich, Switzerland.

202. Morse, W.J. 1930. Re: Soybean products collected. Trip to Manchuria and China. Letter to Dr. E.A. Hollowell, Office of Forage Crops, USDA, Washington, DC, Jan. 12. 2 p. Typed, with signature on USDA letterhead.

• **Summary:** “Dear Holly: I have your letter of December 16 with reference to the soybean products and the more I collect over here the less inclined I am to loan them out... In my last such experience, I fitted up a soybean product exhibit for some sort of health food show in New York City and I never did get it back although we had considerable correspondence about it. As I recall I even took it up with the Secretary [of Agriculture] because they wanted it for a permanent exhibit and so I was out a nice exhibit which it took me considerable time to get up. After that I would not let anything go out unless I had several products of the same kind but it cured me of fixing up exhibits for any one or letting out products or pictures that I could not easily duplicate.

“Therefore, even with Dr. Burlison I do not know of any of the products we have in the office that I care to let out...”

“Last week we visited a large soy sauce factory [almost certainly Kikkoman] at Noda-Machi, about a three hours’ run from Tokio... They use twenty thousands of bushels of soybeans annually and the same amount of wheat.”

“I was rather anxious about the work but as you state if the Arlington [Farm in Virginia] work can be arranged, you and Lee can hold things until I return. I think that this can be arranged so that Lee will not be over-loaded with the work now on hand and the new introductions we are sending in...”

“Dorsett is making pictures of the various [soybean] products as they are collected and making pictures that can

not be beat.

“The beancurd, miso and natto factories are mighty interesting and we are getting lots of good data and pictures as well as samples of the varieties of beans used. The beancurd factories are only small places but they are very numerous and each has its own way of making the curd.”

Location: National Archives, College Park, Maryland. Record group 54—Bureau of Plant Industry, Soils and Agricultural Engineering. Subgroup—Div. of Forage Crops and Diseases. Series—General Correspondence, 1905-29. Box 93—Morse-Napier. Folder—Morse, W.J.-#4 F.C.I.

Sent to Soyfoods Center by Jacob Jones of Purdue Univ., Aug. 1998. Address: Tokio, Japan.

203. Hanzawa, Jun; Tamura, Y. 1930. Nattô seisei-kin ni kansuru kenkyû. V. Chissogen to no kankei [Research on natto bacteria. V. Seen as a source of nitrogen]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 6(8):751-53. Aug. [Jap]  
Address: Hokudai Nôgaku-bu.

204. Morse, W.J. 1930. Soybeans in the Orient. *Proceedings of the American Soybean Association* 3:96-100. Eleventh annual field meeting. Held 10-12 Sept. 1930 in Illinois.

• **Summary:** This letter (which appears on pages 5196 to 5199 of the unpublished Dorsett-Morse Log) was written by William Morse on 20 July 1930 from Dairen, Manchuria, to Dr. W.L. Burlison, President of the American Soybean Growers Assoc. at the University of Illinois. It describes the travels of Dorsett and Morse as agricultural explorers for the USDA, studying soybeans and soyfoods, in Manchuria, Japan (Hokkaido and Tokyo), and Korea (Seoul).

“It is recalled that last season the use of the soybean as a green vegetable was described. Throughout the season, it was found that the green vegetable was a very popular food with the Japanese from one end of the Japanese Empire to the other. The vegetable soybean is classed as a garden bean and as such is extensively grown by the Japanese truck farmers.”

The authors were in Hokkaido from mid-August until early October, and they visited all the principal soybean sections. “The Obihiro station in the eastern part of the island [of Hokkaido] is conducting the most extensive work in breeding and variety testing. We succeeded in collecting a very large number of varieties and selections of this northern region as well as information on culture, harvesting, threshing, insect pests, and diseases. To supplement this material, we obtained a large number of still and motion pictures of very interesting scenes of the Hokkaido soybean industry.”

They arrived in Korea on 20 Oct. 1929 and established headquarters at Keijo (Seoul). “We found Korea to be a most interesting country and different from anything we had seen in Japan. One of the most amazing things was the extent to

which soybeans are grown. Almost equally amazing was the large number of native Korean soybean varieties we found in the various sections and at the experiment stations. At the Suigen Experiment Station, they have more than one thousand native Korean varieties and selections under test. The authorities were very generous and gave us samples of each. In addition to this collection, we obtained a few hundred samples from Korean farmers, grain merchants on village market days and from village and city grain dealers. The Korean Department of Agriculture added about 300 samples to our collection by obtaining seed of the principal varieties from the village agricultural societies in each of the prefectures of Korea.

“Altho the Koreans do not use the soybean as extensively for food as do the Japanese, considerable quantities are used and in quite different ways. The beans are used principally boiled with other grains such as millet or kaoliang. They are also used in making miso and soy sauce, but these products are made quite differently from those of Japan or China. Soybean sprouts are found very abundantly in all of the markets and at all of the small food stores. The beans produced in Korea are for the most part excellent quality and are largely shipped to Japan for the manufacture of miso, soy sauce, bean curd, and natto. Soybeans when soaked with chopped millet or kaoliang straw are used universally for feeding oxen and cows, the common work animals of Korea.

“We left Korea about the first week of December [1929] for our Tokyo headquarters and collected seed samples and products as we went along. From the latter part of December until the latter part of March, we put in full time collecting soybean products and learning of their use and manufacture. We succeeded in collecting a large number of interesting products, as the Japanese use the soybean very extensively in their daily diet. In the making of cakes, candies, and numerous other confections, the roasted soybean is used in a similar manner to the peanut in America. Of course, soy sauce, miso, bean curd, and natto are the principal soybean products and the ones most extensively used. As an example of the large use of miso, which is used as a breakfast soup with vegetables and also in preserving fish, vegetables, and meat, we visited three large miso factories in the Tokyo district and found that each produced about one million pounds of miso yearly. In addition to these three large factories, there were numerous small factories scattered thruout the same district.

“As the planting time was approaching in Manchuria, we left Tokyo the latter part of March and arrived in Dairen, Manchuria, the first of April... This country is the real land of the soybean and Dairen, the real city of the soybean. In 1929, 29.2 percent of the total cultivated area of Manchuria was devoted to the growing of soybeans, producing more than 178,000,000 bushels of seed, thus leading all other crops in acreage and production. The Port of Dairen handles about

eighty (80) percent of the exports of beans, bean cake, and bean oil.

Note: This is the earliest document seen (Aug. 2011) that uses the term “land of the soybean” in connection with or to refer to Manchuria.

“The planting season for soybeans in Manchuria begins about the first of May and extends to about the 25th of May in some northern sections. We, therefore, had an opportunity before the planting season, to study the methods of grading, storage and transportation of [soy] beans, bean cake and bean oil in the oil mills. The storage yards and warehouse yards of the South Manchurian Railway cover several hundred acres and the immense quantities of bags of beans and bean cakes stored in the open storage yards and in the warehouses are well worth seeing...”

“We had rather expected to find a large number of products made from beans, bean cake, and bean oil but our findings thus far have been very meager. The oil is used in the manufacture of soaps, paints, lard substitutes, and salad oils, but only a very few factories are engaged in producing these products. The beans are used chiefly for oil and oil cake, but during the last three or four years, the demand of European mills for beans has had a serious effect, not only on the Dairen soybean oil mills, but also on the oil mills throughout North and South Manchuria. In Dairen, at the present time, only about forty-five soybean mills are active during the crushing season, whereas four years ago there were about ninety. The oil cakes are for the most part shipped to the Japanese Islands for feed and fertilizer (chiefly fertilizer), to China and the East Indies for fertilizer, and to America and Europe for cattle and poultry feed.”

“Our experience in the field up to the present time has been the study of methods of planting and cultivation practiced in different sections of North and South Manchuria.”

We have collected quite a large number of seed samples during our travels thus far in Manchuria and have obtained some very interesting types. It may interest the members to know that we have visited Yingkou (Newchwang), the source of the Virginia and Wilson varieties... At the Kunchuling Experiment Station, more than one thousand varieties and selections have been tested but at the present time only five hundred are under test. The Manchurian varieties do not succeed in the Japanese Islands or Korea and neither do the Japanese varieties succeed in Manchuria or Korea...”

“With this letter we are sending some lantern slides illustrating various scenes of the soybean industry in oriental countries... With best wishes for a most interesting and successful 1930 meeting.”

Note 2. This is the earliest English-language document seen (Feb. 2004) that uses the term “vegetable soybeans” (not preceded by the word “green”) to refer to green vegetable soybeans.

Note 2. This letter was reprinted in *Soybean Digest*

(April 1945, p. 11-12). Address: USDA, Washington, DC.

205. Abe, K. 1930. [Changes of protein under processing]. *Morioka Kono Dosokai Gakujutsu iho (Bulletin of the Scientific Researches of the Alumni Association of the Morioka College of Agriculture and Forestry, Morioka)* 6:1-7. [Jap]\*

206. **Product Name:** Natto.

**Manufacturer's Name:** Higuchi Natto-ten.

**Manufacturer's Address:** 2318 East 1st St., Los Angeles, California. Phone: ANGelus 8155.

**Date of Introduction:** 1930.

**Ingredients:** Incl. whole soybeans, natto starter culture.

**New Product–Documentation:** The Japanese American Directory. 1930. p. S-53. Note: This is the 2nd earliest known commercial natto made in the United States. Also in 1932, p. 346 (directory).

207. Kobasi, S. 1930. [Studies on mannase of microorganisms]. *Chosen Igaku (Korean Medicine)* 20:1221-1330-. [Jap]\*

208. Muramatsu, Shinsuke. 1930. Nattô ni kansuru jikken [Experiments with natto]. *Gakujutsu Kyoho* 5:340-. [Jap]\*

209. Yamamoto, Yoshihiko. 1930. Nattô-kin no katalase ni tsuite [On the katalase of *Bacillus natto*]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 4(11):922-39. [31 ref. Jap; ger] Address: Applied Mycology Lab., Faculty of Agriculture, Hokkaido Imperial Univ., Sapporo, Japan [Hokkaido Teikoku Daigaku, Nôgaku-bu].

210. Japanese American News Inc. / Nichi-Bei Shinbunsha. 1930. Nichibei jûshoroku [The Japanese American directory. No 26]. San Francisco, California: Nichi-Bei Shinbunsha. 765+ p. Index of cities. 23 cm. [Eng; Jap]

• **Summary:** Most entries in this directory give the company name in Japanese characters, followed by the address and phone number (if any) in English. There are many smaller, vertical ads on the lower half of quite a few directory pages, usually for a company listed on that page. Most are either mostly or entirely in Japanese.

Contents: Ads (full- or half-page, in Japanese and English, p. A-1 to A-34). Table of contents of Japanese businesses in San Francisco, organized by type of business (p. 3). Directory of northern California (in Japanese and English, p. 3-394). Table of contents of Japanese businesses in Los Angeles, organized by type of business (S-19). Directory of Los Angeles, Southern California, and all other U.S. states (p. S-1 to S-340).

On the front cover (which is mostly in English and is at the “back” of the book) is an illustration of the dome of city hall. In the center, vertically in Japanese characters

is written *Nichibei Shinbun-sha*. The many directory listings for soyfoods manufacturers and ads for soy-related companies are each given separately. Address: Ellis Street, San Francisco, California.

211. Kairiku Shokai. 1930. Kairiku Co. (Ad). In: The Japanese American News. 1930. The Japanese American Directory (*Nichibei Jûshoroku*). No. 26. p. A-31. [Jap; Eng] • **Summary:** Ad (half page vertical). The top ¼ of this ad is in English. They deliver fresh fish and vegetables very fast. They sell natto—A famous product of Iizaka hot springs (*Onsen*) [north of Fukushima city, Fukushima prefecture, northeastern Japan]. Address: 1611 Laguna St., San Francisco, California. Phone: WEst 4505.

212. Eguchi, Yû; Kamishiro, Nobutoshi. 1931. B gata parachifusu kin hoyû-sha no ichi chicken. I. [Cure of a paratyphoid B patient by eating *Bacillus natto*]. *Kaigun Gun-ikiai Zasshi (Bulletin of the Naval Medical Association)* 20(3):245-47. June (Roman numbering: p. 83-85). [Jap] • **Summary:** In this first report on the effect of natto on bacteria, the author describes the use of natto to cure a patient with paratyphoid. Address: 1. Kaigun Guni Chûsa; 2. Kaigun Guni Taii. Both: Saseho Kaigun Byôin (Saseho Naval Hospital), Japan.

213. Kurosawa, T. 1931. Sake, biiru, kôbo oyobi ni nattô-kin ni yoru gyôshû soshitai genshô [Antiagglutination or anticoagulation phenomena by sake, beer, yeast, and natto microorganisms]. *Hokkaido Igaku (Hokkaido J. of Medical Science)* 9(6):1108-23. June. [19 ref. Jap] • **Summary:** Nakazawa (1950-1964, at Natto Bacteria) gives the title as “Antiagglutination phenomena of yeast and natto bacteria.” Address: Hokkaido Teikoku Daigaku, Igaku-bu, Hôigaku Kyôshitsu (Shunin Yamagami Kyôju).

214. Kurosawa, T. 1932. Saccharomyces sake, myceloblastanon Sapporo A oyobi Bac. nattô ni yoru kôchaku genshô ni tsuite. II. [Agglutination by *Saccharomyces sake*, myceloblastanon Sapporo A, and *Bacillus natto*. II.]. *Hokkaido Igaku (Hokkaido J. of Medical Science)* 10(1):30-45. Jan. [22 ref. Jap] Address: Hokkaido Teikoku Daigaku, Igaku-bu, Hôigaku Kyôshitsu (Shunin Yamagami Kyôju).

215. Dugard, Jean. 1932. La valeur alimentaire et industrielle du soja [The food and industrial value of soya]. *Genie Civil (Le)* 100(17):419-20. April 23. [3 ref. Fre] • **Summary:** Contents: Introduction. *USDA Farmers' Bulletin* No. 1617, by W.J. Morse. Botanical characteristics of the soybean. Composition and food value of the soybean. Products derived from soya eaten by humans: Tofu, soy oil, shoyu [soy sauce] (called “soy” in English), soy flour, soy sprouts, miso, natto. The use of soya as forage. Industrial

uses of soy oil and cake. The soybean in western Europe: Hansamuehle in Hamburg, Germany; Englehardt & Cie. in Frankfurt, Germany (making powdered soymilk, soy caseine, soy lecithin, etc.); Soybean cake used for animal feed in England, Denmark, Holland, Sweden, and—above all—in Germany, where more than 2 million tons/year are consumed.

216. Abadal, D. Jose; Soroa, Jose Maria. 1932. Cultivo y aplicaciones de la soja [Cultivation and applications of the soybean]. Madrid: Patronato Central para la Proteccion de Animales y Plantas. 44 p. Illust. [Spa]

• **Summary:** Contents: Introduction (preliminary notes). Part I: Cultivation and applications of soya. Chart of utilization of the soybean seed. Agronomic notes and details on soybean cultivation. Part II: Soya as a food. Nutritional value, soya as a vegetable (green vegetable soybeans; *Soja, como verdura*), soy sauce (*salsa de soja*), soymilk (*leche*), condensed soymilk (*leche concentrada / condensada*), powdered soymilk (*leche en polvo*), fermented soymilk (*leche fermentada*), soy cheese (*queso de soja*) [tofu], soy casein (*caseina de soja*), soy flour (*harina de soja*), soy bread (*pan de soja*), Soyolk (soy flour made by Dr. Berczeller), whole-grain soy bread (*pan integral*), soy flour tablets (*comprimidos*), pastries, biscuits, puddings, etc. (*pasteles, bizcichos, puddings*), soy oil (*aceite de soja*), fermented soy products (*productos de la soja fermentada: natto, miso, shoyu*), confectionery products (*productos de confiteria*), chocolate (*chocolate*), coffee (*café*), soy ferments/enzymes (*fermentos de soja*), products made by Caséo-Sojaïne (*Caseo-Sojaïne de Paris*). Soy as a livestock food. Appendix.

“As early as 1918 a Spanish public official, Don Julio de Palencia, the Spanish Consul in Shanghai, sent the State Department (*Ministeria de Estado*) a magnificent report specifying the great attention that representatives of the principal countries of the world were giving to this crop [the soya bean], and the relevance that it would have in the agricultural economy of the future. What a pity that Spain has been the only civilized country to ignore the study of the soya bean and its exploitation on a large scale” [p. 5].

“Finally we must make public our thanks to the spokesmen of this foundation/board (*Patronato*) for the special work they have done in writing this booklet: Don José Maria de Soroa, secretary of the Special School for Agricultural Engineers (*Escuela Especial de Ingenieros Agrónomos*), and Dr. Don José Abadal, chief of the Bureau for the Inspection of Pharmaceutical Services of the Ministry of War (*Negociado de la Inspección de Servicios Farmaceuticos del Ministerio de la Guerra*)” [p. 6].

“In 1917 the Spanish Consul in Shanghai, Don Julio Palencia, sent to the State Department a study on cultivation of soya, proposing that tests be done to acclimatize this valuable crop to our country.

“In Motril and later at the southern agricultural station

of Malaga, the agricultural engineer D. Arsenio Rueda has been cultivating soya for the past 10 years [i.e. since 1923] in plots of 5 ares [1 are = 100 square meters], obtaining 60 liters (each liter weighing 780 gm) in each one.

“The white as well as the black varieties give good results, though the white ones do best. The seeds have been distributed to farmers who have noticed that, even though at first the goats that were given them as food rejected them, after a few days of getting used to this grain preferred them to such an extent that one must avoid growing this plant near the herd’s path lest the herd be attracted and devour it all.

“Although soya is a legume which draws many nutrients out of the soil (*esquilmante*), it has according to Mr. Rueda, sufficient interest since it allows usage of terrains where field beans cannot be used due to the invasion of the pest called *Orobanche speciosa*, commonly called ‘Jopo.’ This parasite does not attack soya...

“Besides the quoted trials, it has been more than 25 years since soy has been grown in Spain with success due to the interest and zeal that in their patriotic work, the agricultural engineer Mr. Eduardo Noriega undertook with his partner, Mr. Ortiz, on the farm of ‘Jerez.’

“He was successful during many years using the yellow and black varieties, later on also cultivating it in the Spanish central region.

“We think it useful also to state in writing the following data about soy grown by Dr. D. Jose Abadal in Lerida during the years of 1925-1926.

“The experiment was done only out of curiosity, with the intention of seeing if it could be grown in said province. Japanese seeds of the hirsute soy variety, yellow seed, used as food for diabetes, were used. The planting was done in a garden with seeds that had been soaked for ten hours, with no more care or fertilizers than those used for all the existing plants of that garden. The terrain of course was one of easy irrigation and located in Lerida where it is very hot all during the summer.

“This brief essay demonstrates that soy can be grown in irrigated terrain in very hot places and with little care.

“Fifteen years ago, the agricultural Engineer D. Jesus Andreu, in the province of Pontevedra [in the northwest corner of Spain, just north of Portugal, bordering the Atlantic ocean], did some tests with good results on growing soy as a forage plant.

“We also have news, though not concrete, of other successful tests done in the provinces of Madrid and Toledo.” Address: 1. T.C. Farmaceutico Militar; 2. Ingeniero Agronomo e Ingeniero Sanitario, Spain.

217. Orosa, Maria Y. 1932. Soybeans as a component of a balanced diet and how to prepare them. *Manila (Philippines) Bureau of Science, Popular Bulletin* No. 13. 53 p. [16 ref]

• **Summary:** Contents: Introduction. The cooking of soy beans (89 Filipino recipes, p. 7-35), incl. roasted soy beans,

soy-bean soups etc.—most recipes use whole soybeans, but quite a few use tofu (*tokua*), soy sauce (*toyo*), soy-bean flour, or soy-bean milk, and a few use *tahuri* (brine fermented tofu) or soy-bean sprouts. Some common foods made from soy beans and methods of preparing them (p. 35-53): Soy-bean milk, condensed soy-bean milk, soy-bean milk powder, soy-bean casein, soy-bean curd (tofu; *tokua* or *toqua*). *Tahuri* or *tahuli* (fermented tofu). Frozen tofu. Bean curd brains or *tofu nao*. Dry bean curd or *topu khan* (tofu-kan, dipped in burnt millet sauce and rubbed with fine salt). Fragrant dry bean curd. Thousand folds (thin layers of fresh tofu pressed in cheesecloth. “On standing, the thousand folds mold and develop a meatlike flavor. This is fried in sesame oil and served in place of meat”). Fried bean curd. Soy sauce (called by the Chinese “ch’au yau,” or drawing oil; or “pak yau” or white oil; by the Japanese “shoyu”; and the Filipinos, “toyo”). Natto. Hamanatto (p. 49). Yuba. Miso. Soy-bean flour. Soy-bean oil (used in the manufacture of lard and butter substitutes; also in paints, printing inks, etc.). Soy-bean meal. Soy-bean coffee. Soy-bean sprouts.

Note 1. This is the earliest English-language document seen (Oct. 2008) that uses the term “soy-bean casein” (or “soy bean casein” or “soybean casein”), probably to refer to soybean protein.

“When and by whom the soy bean was first introduced into the Philippines, no one can ascertain. The Filipino people have long known some important soy-bean preparations, such as soy sauce, or ‘toyo,’ bean curd, or ‘tokua,’ fermented bean curd or ‘tahuri,’ not knowing that they were prepared from this bean. The seed is known in some parts of the Philippines, where it is grown, as ‘utao.’”

“The main object of this pamphlet is to encourage the Filipino people to use more soy beans, and preparations made from them as food” (p. 3-4).

“Soy beans are grown in some parts of the Philippines. According to Doctor Roxas, Director of the Bureau of Plant Industry, 2,481 tons were grown in Batangas in 1921 and 4,218 tons, in 1930. However, the importation of soy beans in 1924 was 4,657 tons. Doctor Roxas says that soybeans can be grown in all parts of the Philippines” (p. 6). “Immature soy beans may be cooked in the same way as lima beans (*patani*)” (p. 7).

“The soy-bean curd was first produced by Whai Nain Tze, before the Christian Era and was introduced into Japan from China by the Buddhists. It was introduced into the Philippines by the Chinese and has become a very popular food in Manila and in places where there are Chinese who manufacture it for sale. ‘Tokua’ on account of its high fat, protein, and mineral content, is called by the Chinese as ‘meat without bone,’ or ‘the poor man’s meat.’” The Chinese use burnt gypsum (about 1.5% by weight) as a coagulant. In some cases, the curds are wrapped in individual pieces of fine cheesecloth about the size of a small handkerchief, then pressed lightly for a few minutes. They are “unwrapped,

spread on shallow bamboo trays (*bilao*) and partially dried at room temperature. Then they are dipped in a weak solution of turmeric to coat the outside in light yellow coloring. Some manufacturers soak the small cakes of curd in brine solution for a short time, then dip them in a solution of burnt sugar or molasses and bake them slightly before putting them on the market.” 100 gm of dry soybeans typically yield 350 gm of tofu (*tokua*) (p. 41).

The section titled “‘Tahuri’ or ‘Tahuli’” begins with 2 paragraphs and ends with a table very similar to those from Gibbs and Agcaoili (1912): “‘Tahuri’ is manufactured in China and exported to the Philippines in large stone jars or in small tin cans. There are some ‘tokua’ manufacturers in Manila that manufacture ‘tahuri’ for local consumption. Those that are imported from China are preserved in strong brine solution and the cakes are broken during the shipment so the liquid becomes like a thick emulsion containing pieces of the cured curd.” It then contains a new paragraph: “In Manila, the Chinese method of manufacture is to pack the large pieces of soy-bean curd, about 5 inches long, 4 inches wide, and 2.5 inches thick, with much crude salt, in empty gasoline cans. The curd is allowed to cure for a period of several months. During the curing period the bean curd changes from white to a brownish yellow color and develops a peculiar salty flavor to which the Chinese and many Filipinos are educated” (p. 42). Note 2. No information about a fermentation microorganism or process is given.

“The bean curd brains known to many Filipinos as ‘tojo’ is the unpressed soy-bean curd. The method of making ‘tojo’ is almost the same as the method used in making ‘tokua’, only that a smaller amount of the coagulating agent is used, and the very soft but solid mass formed is left undisturbed in the wooden container until used. The Chinese used to peddle this preparation in a wooden pail-shaped container, through different parts of Manila, but on account of the Philippine Health Service regulations, this product is now sold in the markets only. / “The ‘tojo’ is served with a few tablespoonfuls of medium thick brown-sugar syrup, which gives it flavor, the ‘tojo’ being almost tasteless. Sometimes it is eaten with sweet oil, sauce, and vinegar, or with finely cut meat and spices.” (p. 43).

“Dry bean curd: The fresh bean curd when dipped in burnt millet-sugar sauce and rubbed with fine salt will keep longer than the ‘tokua’ and is called ‘topu khan.’ This preparation is usually eaten in soups.”

Fragrant dry bean curd or *hsiang khan* (“fragrant dry”) has the consistency of smoked sausage. “It is made by subjecting the fresh bean curd to great pressure, which eliminates much of the water content. The pieces of semidry curd are soaked in a weak brine solution in which is dissolved burnt millet-sugar and to which is added powdered spices. The curd is then dried to hardness. This preparation keeps indefinitely and is used in soup making and in vegetable dishes” (p. 43).



Note 3. Cruz and West (1932, p. 78) state that as part of a campaign by the Bureau of Science to encourage the Filipino people to use more soy beans, Miss Orosa “has made excellent cakes, cookies, puddings, sauces, soups, custards, ice cream, and other tasty preparations from Philippine soy beans.”

Note 4. The author pioneered the branch of the branch of the Home Extension Service in which home demonstrators helped women in solving their home problems. She started the organization as a food preservation unit under the Bureau of Science in 1923, starting with six home demonstrators that she herself trained. That group became the forerunner of the Home Extension Service in the Philippines. For details on her work see: In: *A Half Century of Philippine Agriculture*. Manila, Philippines: Liwayway Publishing. p. 236-37.

Note 5. This is the earliest English-language document seen (Nov. 2003) that contains the word “meatlike.” Address: Chief, Div. of Food Preservation, Bureau of Science, Manila.

218. Winton, Andrew Lincoln; Winton, Kate Barber. 1932. *The structure and composition of foods: Vol. I. Cereals, starch, oil seeds, nuts, oils, forage plants*. New York, NY: John Wiley and Sons; London: Chapman & Hall, Ltd. xiv + 710 p. See p. 512-24. Illust. Index. 24 cm. [67 soy footnotes] • **Summary:** Volume 1 of this 4-volume set contains 274 superb illustrations by the authors. The book is divided into three parts: I. Cereals. II. Oil seeds. III. Forage plants.

In the chapter on “Seeds of the pea family (Leguminosæ)” (p. 497+) the section titled “Soy bean” (p. 512-24) has the following contents: Scientific and common names. Introduction. Macroscopic structure. Microscopic structure: Spermoderm, hilum cushion, endosperm, embryo (palisade cells, oxalate crystals, starch, aleurone grains and fat), chief structural characters. Chemical composition: Changes in composition during growth, soy bean cake, meal, and flour, proteins, carbohydrates, phosphorus-organic compounds, saponins, enzymes, mineral constituents, minor mineral constituents.

The chapter begins: “A native of the Far East, the soy bean has been cultivated since the dawn of civilization in China and Japan, where the seeds furnish millions of human beings with food. From the seeds are prepared soy cheeses (tofu, natto, miso [sic, none of these three are “soy cheeses”]), soy milk, and soy sauce, the latter being used in chop suey. Because of the absence of starch in many varieties soy bean flour has come into use in the Occident as a diabetic food. Soy bean oil is of growing industrial importance.”

An illustration by Winton (p. 512; Source: Winton 1906, p. 248) shows the outer portion of the soy bean seed in cross section, with each of the layers (X 160 magnification).

In the introductory section on “Forage legumes,” soy beans are discussed under the following headings (p. 642-45): Comparative macroscopic structure, comparative microscopic structure (table), comparative chemical

composition of green fodder (p. 644) and of hay (p. 645). The section titled “Soy bean” (as forage plant, p. 666-67) has the following composition: Introduction. Macroscopic structure. Microscopic structure: Stem, petiole, petiolule, leaf, stipule, flower, chief structural characters. Chemical composition (values from Pellet, Schwackhöfer, and Haskins for: Total ash, potassium oxide, sodium oxide, calcium oxide, magnesium oxide, ferric oxide, phosphoric acid, sulfur trioxide, silicon dioxide, and chlorine).

Note: This is the earliest English-language document seen (Jan. 2004) that uses the word “petiolule” in describing the soybean plant.

This book also discusses: Lecithin (p. 8, 14). Kudzu starch (*Pueraria hirsuta* Schneider, p. 37). Gluten (p. 57-59, 72-73, 199-200, 211-25). Coix (Job’s tears, p. 100-04). Hemp seed (p. 413-21). Almond (p. 476-85). Peanut (p. 497-512, 642-43, 663-66). Linseed (p. 525-35). Sesame seed (p. 598-605). Alfalfa (p. 642-43, 646-59).

Note: Andrew L. Winton lived 1864-1946. Kate Grace Barber Winton was born in 1882. Address: 1. Sometime state and federal chemist; 2. Sometime state and federal microscopist.

219. Ishimaru, Yoshio. 1933. Shōyu jōzō ni kansuru saikin no kenkyū. II. [Research on the bacteria involved in shoyu fermentation. II.]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 11(7):576-96. [4 ref. Jap]

• **Summary:** Part II discusses: 6. *Bacillus subtilis* var. *Soya*. 7. *Bacillus noudiastaticus* var. *Soya* No. 1. 8. *Bacillus noudiastaticus* var. *Soya* No. 2. 9. *Bacillus alcaligenes* var. *Soya*. 10. *Bacillus megatheroides* var. *Soya*. 11. *Bacillus citreus* var. *Soya alpha* 12. *Bacillus citreus* var. *Soya Beta*. Address: Nōgaku hakase, Japan.

220. Suzuki, Tsuneya. 1933. Hakko to vitamin. V. Nattō-kin wa vitamin B-1 o gōsei suru ya [Fermentation and vitamins. 5. Do natto bacteria synthesize vitamin B-1?]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 11(7):605-07. [2 ref. Jap] Address: Osaka Teikoku Daigaku, Kōgaku-bu, Jōzōgaku Kyōshitsu, Takada Kenkyūshitsu, Osaka, Japan.

221. Miller, Carey D. 1933. Japanese foods commonly used in Hawaii. *Hawaii Agricultural Experiment Station, Bulletin* No. 68. 43 p. Nov. See p. 1-10, 28-43. [18 ref]

• **Summary:** Contents (p. 1-10): Introduction. Soybean products. Edamame (green soybeans). Tofu (soybean curd). Kirazu (tofu residue) [okara]. Tonyu (soybean “milk”). Aburage (fried soybean curd). Miso (fermented rice and soybeans). Natto (fermented soybeans). Shoyu (soybean sauce). Koji (fermented rice). Pages 24-15: Kinoko (mushrooms). Fu (gluten cakes). Goma (sesame seeds).

Pages 28-43 (Ingredients and nutritional composition of prepared foods or recipes): Miso soup with tofu. Miso soup with wakame. Miso soup with daikon. Miso soup with milk.

Tofu soup with lemon. Tofu shoyu soup. String bean shirae [shira-ae] (with tofu and miso). Carrot shirai. Konnyaku shirai. Eggplant with miso. Green onions with miso. Fish cakes with miso. Sesame seed sauce for vegetables (with shoyu). Nishime (with shoyu). Nigome (with aburage and shoyu). Kirazu with vegetables (with okara, aburage, shoyu). Noodles (somen or udon, with shoyu). Vinegar sauce for sushi. Inari-sushi (with aburage and shoyu). Maki-sushi. Appendix: Composition of some Japanese foods used in Japan.

Concerning edamame: “The Japanese use several varieties of fresh green soybeans. In Honolulu whole plants are purchased from the vegetable market. The pods are removed from the plants, placed in boiling salted water, and boiled for about 25 minutes. They are then drained and cooled, and the beans are kept in the pods until eaten. Often children eat them out of bags as they would candy. The fresh green soybeans appear to be an excellent food. They are good sources of calcium, phosphorus, and iron, yield a basic ash, and, as compared with other fresh vegetables and fruit, have a remarkably high protein content. Vitamin tests in progress at the nutrition laboratory of the Hawaii Agricultural Experiment Station show that the cooked beans are very good sources of vitamins A, B, and G. The more general use of green soybeans should be encouraged in the home, and their consumption may be increased by selling them in school cafeterias.”

Concerning Kirazu (tofu residue): “Kirazu, or the residue of the soybeans left when tofu is made, has a crude fiber content of 3 to 4 percent, contains 4 to 5 percent of the protein of the beans, more than 1 percent of the fat, and 5 to 6 percent of the carbohydrate. Only a small part of kirazu is used for human food in Hawaii, by far the greater part being used as hog feed. Kirazu, however, is a utilizable, inexpensive food and might be more generally used than it is... Kirazu is used in combination with vegetables, or with fish, or dried shrimp, and seasonings.”

Concerning natto: Describes the process for making natto on a commercial scale in Honolulu. After cooking (without soaking) for about 8 hours in a large iron kettle, the “beans are thoroughly drained and placed on paper plates covered with wax paper. The plates are stacked one above another in large wooden boxes, covered with rice straw mats, and kept at a temperature of approximately 30°C. for 35 to 36 hours, when the product is ready for use... The fermented product is covered with a gray, slimy substance that forms strings or threads when the beans are pulled apart, indicating good quality... Although no molds or yeasts are added to the cooked soybeans, O.N. Allen, of the botany department of the University of Hawaii, who examined several samples of fresh natto from Honolulu, found 2 molds, 4 bacteria, and an aspergillus present. The enzymes of some of these organisms probably caused the conversion of a small part of the protein to simpler substances.”

Concerning Inari-sushi (p. 37): The “ingredients required for this dish are rice, water, salt, aburage, carrots, mushrooms, string beans, gobo, flaked bonito, water, sugar, shoyu, and vinegar sauce.” A detailed recipe is given.

Photos show the following (each food accompanied by its Japanese name written in both Chinese characters and *katakana*): Edamame, in the pods on the plant, and shelled in a dish. Tofu kasu [okara] on a plate. Tofu on a dish. Soymilk in a glass. Three triangles of aburage on a dish. Miso on a dish. Natto in a white rectangular commercial paper tray about 3½ by 6 by 1 inch deep. Koji on a plate.

Note 1. This is the earliest English-language document seen (June 2009) that uses the term “fresh green soybeans” to refer to green vegetable soybeans.

Note 2. This is the earliest English-language document seen (Oct. 2001) that uses the Japanese word *kirazu* to refer to okara.

Note 3. This is the earliest document seen (July 2003) that mentions commercial natto production in Hawaii.

Note 4. This is the earliest English-language document seen (Jan. 2012) that uses the word “strings” or “threads” in connection with natto.

Note 5. This is the earliest English-language document seen (June 2011) that uses the term “fried soybean curd” to refer to aburage or fried tofu or to deep-fried tofu pouches. Address: Specialist in Nutrition, Honolulu.

222. Carqué, Otto. 1933. Vital facts about foods: A guide to health and longevity with 200 wholesome recipes and menus and 250 complete analyses of foods. Los Angeles, California: Published by the author. 208 p. Index. 24 cm. [20+\* ref]  
 • **Summary:** This manual of food reform discusses the importance of a simple vegetarian diet of natural foods, sunlight and sunbaths, fresh air, pure water, exercise and rest. Also talks about acid and alkaline foods, the influence of mind on health, the failure of synthetic foods, why refined sugar is injurious, the dietetic value of sea plants, table salt is unnecessary and harmful, fruit is man’s best food, sulphured and unsulphured fruits, nut butters, food preparation, and the treatment of disease.

The germ theory of disease has not been proven since potentially harmful germs are omnipresent yet often fail to harm healthy individuals (Pasteur was a chemist and laboratory worker, not a physician. Germ action is always secondary; “when germs invade a living organism it is a sign that the organism is enervated and its chemistry perverted.” p. 114-15).

The section titled “Fruit and nut confections” (p. 133-35) begins: “Fruit and nut confections made without refined sugar and glucose should take the place of candies.” These “sweet-meats”... “should be the only kind of confections allowed to growing children, which have a natural craving for sweets.” Recipes include stuffed dates, date caramels, nut fruitose, carob confection, raisin-nut balls, and honey

cocoanut balls. For Nut fruitose: Mix dates, figs, raisins, almonds and walnuts. "Run through a food chopper twice. Press the mixture into a flat pan in a layer about 1 inch thick, let stand overnight, and cut into convenient sizes." Note: Carque was a pioneer in the development of healthy, natural treats. The last recipe could be considered a forerunner of the less-healthy "nutrition bar" of the 1990s.

The next section, titled "Nuts and nut butters," states that "salting and roasting greatly impair the nutritive value of nuts and prevent their proper assimilation. The proteins become coagulated by roasting, and the fats split into glycerine and free fatty acids, while the vitamins are destroyed. Nut butters made from salted nuts should, therefore, have no place in our dietary." Rather, the peanuts or almonds should be blanched (scalded or parboiled in water or steam). "Since few people, on account of defective teeth, can masticate nuts well enough to be acted upon by the digestive juices, the mechanical emulsification of nuts by means of nut butter mills is quite dispensable."

The section titled "Melba toast" and "Melbettes" (p. 156) states: "These are delicious dextrinized whole wheat products made by the Cubbison Cracker Co., Los Angeles." Melbettes are also made from whole rye. "Calavo Melba Toast is another tasty whole wheat product; it contains the natural fruit fat of the California Avocado or Alligator Pear as shortening."

The section titled "Natural whole rice" (p. 156) notes: "Whole rice, also called brown rice, contains the bran, cuticle, and germ of the cereal. In milling nothing has been removed but the husk and dirt."

The section titled "The Soy Bean, a Remarkable Food" (p. 158-61) discusses boiled soy beans, soy bean milk, tofu ("it is called by the Chinese 'the meat without a bone...'" Other preparations of the soy bean, which are but little known in this country, are *natto*, *hamananatto* [*hamanatto*], *yuba* and *Miso*. The principal use of miso, which is a slightly [sic] fermented mixture of soy beans and rice or barley, is for making soups and for cooking vegetables"), soy sauce, soy bean sprouts, and various recipes. Under "Ready made soy bean products" (p. 161) we read: "As the preparation of the soy bean in the average household is often not convenient, the author has arranged to supply the following products at reasonable prices: Canned Soy Beans, Soy Bean Spread, Soy Bean Stew, Soy Bean Loaf, Soy Vegetable Onion Soup, Soy Bean Vegetable Bologna, Soy Bean Tasty Lunch, to which others will be added in the course of time. These products have met with ready approval, as they fill a long felt want for tasty, nutritious and wholesome vegetable protein foods to substitute meat and dairy products."

The author's signature appears at the end of the Preface. Address: Los Angeles, California.

223. Hanzawa, Jun; Tamura, Hiroshi. 1934. Nattô seisei-kin ni kansuru kenkyû. VI [Research on natto fermentation

bacteria. VI.]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 10(5):520-21. [Jap] Address: 1. Nôgaku hakase.

224. Abe, K. 1934. [Mucilaginous substance of "natto," a Japanese food. I. Alcohol soluble nitrogenous compounds in the substance]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 10(6):545-49. [10 ref. Jap]

225. Matsumura, T. 1934. [Experimental works for patient with application of antagonism. I. Studies on natto]. *Kyoto Furitsu Ika Daigaku Zasshi (J. of the Kyoto Prefectural University of Medicine)* 12:38-52. [Jap]\*

• **Summary:** In three studies in 1934 the author demonstrated that *Bacillus natto* was antagonistic to the typhus organism, either when they were started together or after typhus had been grown earlier. In mice, if inoculated at the same time, the mice died, but if the *B. natto* was injected 24 hours before the typhus, then the mice lived. Address: Bacteriologist, Tokyo Univ., Japan.

226. Matsumura, T. 1934. [Experimental works for patient with application of antagonism. II. Antagonism between *Bacillus natto* and typhus *in vitro*]. *Kyoto Furitsu Ika Daigaku Zasshi (J. of the Kyoto Prefectural University of Medicine)* 12:54-89. \*

227. Matsumura, T. 1934. [Experimental works for patient with application of antagonism. III. Antagonisms between *Bacillus natto* and typhus *in vivo*]. *Kyoto Furitsu Ika Daigaku Zasshi (J. of the Kyoto Prefectural University of Medicine)* 12:1185-1210. \*

228. Nomura, H. 1934. [Studies on natto. 2. 3. Change of protein during the manufacturing process]. *Kanagawa Ko-Shi* 4:22-. [Jap]\*

229. Suzuki, T. 1934. Hakkô to bitamin. V. Nattô kin wa bitamin B-1 o gôsei suruya [Fermentation and vitamins. V. Synthesis of vitamin B-1 by *Bacillus natto*]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 11:605-07. [2 ref. Jap] Address: Osaka Imperial University (Osaka Teikoku Daigaku).

230. Adachi, Isamu; Sakurai, Shigeru. 1934. Nihon shokumotsu-shi [History of Japanese foods]. Tokyo: Yuzankaku. 480 p. [Jap]

• **Summary:** This is the best book seen on the history of Japanese foods. The following soyfoods are discussed: Firm tofu, soymilk and okara (p. 290-91; discusses the *Teikun Oraï* by Iseño Teijô, tofu-kan, tofu-jiru = soymilk, setsurun-sai = okara), yuba (p. 336), shoyu and tofu (p. 370-71), unohana (okara, p. 377), tofu and natto (p. 382-83).

231. Haskin, Frederic J. 1935. Questions of readers answered. *Hartford Courant (Connecticut)*. Nov. 4. p. 6.

• **Summary:** “Q. What is natto? G.B.R.

“A. Natto, commonly called cheese, is a Japanese fermented food product prepared from soy beans. Although its manufacture varies, probably with the locality, it is a common practice to boil the soy beans until tender and then leave them in a warm place for 24 hours until they have fermented.”

232. Ide, M. 1935. [Culture media from natto and polytamin as substitute of peptone]. *Saikin (Bacteria)* 470:298-. [Jap]\*

233. Nomura, H. 1935. [Studies on natto. 2. 3. Change of protein during the manufacturing process]. *Kanagawa Ko-Shi* 5:8-. [Jap]\*

234. Crespi, Luis. 1935. La soja y su cultivo [The soybean and its cultivation]. Spain. 32 p. Series: Catechisms for Farmers and Cattlemen/Stock-Farmers (*Catechismos del Agricultor y del Ganadero*). 17 cm. [Spa]

• **Summary:** Contents: I: Cultivation of the soybean (*la soja*; p. 3-18): 1. Description of the plant. 2. Origin of the soybean. 3. Varieties of soybeans (*Varietades de sojas*): Early maturing, semi-late, late. 4. Needs of the soybean: In water, in soil, in fertilizer. Fixation of nitrogen from the air in soybeans. 6. Place in the rotation. 7. Preparatory work. 8. Planting: Carrying out the sowing, the necessary seeds, depth of planting. 9. The seeds sprout. 10. Cultural care. 11. Maturity. 12. Diseases (*enfermedades*). 13. Harvest: As a forage plant, as a producer of seeds. 14. Yield.

II: Applications of the soybean (p. 19-28). 1.

Composition of the plant: Composition of soybean forage, composition of the seeds, composition of the straw (*la paja*). 2. The soybean in the feeding of animals: As a forage plant, as a plant that produces seeds, soybean cakes (*tortas de soja*), soybean straw. 3. The soybean as a human food. 4. Industrial products from the soybean (from the oil: paints and varnishes, soap). 5. The soybean as a fertilizer.

III: Geographic distribution: 1. Worldwide cultivation of the soybean. 2. The soybean in Spain.

The soybean as a human food (p. 27): The seed is rich in protein. Whole soybeans (*Semillas de soja*) can be used like French beans and peas, mature and dry, and toasted like peanuts. The first two leaves of very small soybean plants (*Plantitas de soja*) can be used in salads or cooked. Soy flour can be used in bread, pastries, biscuits, or diabetic diets. Condiments, widely used in China and Japan, include natto, miso, tou-chiang, and shoyu. One can make soymilk (*leche de soya*), and use it to make soy cheeses (*quesos de soja*). The seeds of certain varieties can be roasted to make substitutes for cocoa or coffee.

Soybean cultivation worldwide (p. 29-30): In France,

starting in 1880, the house of Vilmorin, started selling the variety Etampes. Also in 1880, the soybean was cultivated in Portugal in the Botanical Garden at Coimbra (in west central Portugal).

“The soybean in Spain (p. 30): Thirty five years ago [i.e., in about 1900] my father tried cultivating soybeans in Pontevedra. [Note: Pontevedra is a province and city in the northeast corner of Spain, just north of Portugal, on the coast of the Atlantic Ocean. The city is near the mouth of the Ria de Pontevedra, at about 42.4° north latitude]. For two consecutive years, and using seeds of the variety Etampes from the House of Vilmorin seedsmen, he obtained identical results: excellent vegetation, but a small yield of seeds because the plants failed to fully mature.

“More than thirty years ago [i.e., before 1905], the count of San Bernardo tried growing the soybean, with excellent results, on his estate ‘El Alamillo,’ at Ecija (near Seville).

“In 1910 the soybean was cultivated by Mr. Noriega in Jerez (near Cádiz {Cadiz}), and the results obtained seem to indicate that the harvest was of medium size due to the poor condition of the seeds; but the plant responded brilliantly, showing healthy growth and resistance to the drought.

“In 1917 the ambassador of Spain stationed in Shanghai forwarded to the Commercial Information Center of the Spanish Secretary of State three varieties of soybean seeds: small black, yellow, and green. These seeds were very probably used in cultural trials, even though we do not know the results that were obtained. In the same year Mr. Juan Abril reported in the periodical *Revista Ibérica [Iberian Review]* of his successful soybean trials conducted in Tortosa (in Tarragona province [in northeastern Spain]).

“Finally, during the years 1914 and 1915, Mr. Santiago F. Valderrama, the brigadier general from Artilleria [Artilleria], conducted soybean cultural trials in Montilla (in Córdoba / Cordova province).

“To his cultivation and enthusiastic encouragement of the cultivation of this plant in Spain, we owe the photograph on the cover of this little instruction book. It shows the top of a mature soybean plant grown by him in Montilla. Two more generations of soybean plants were cultivated in the same locality.”

Illustrations (line drawings) show: (1) Leaves of the soybean and the common bean (*judía* = *Phaseolus vulgaris*) (p. 4). (2) Flowers of the soybean and the common bean. (3) A soybean stem, with 3 leaves and 2 pods; an opened soybean pod showing 3 seeds (p. 5). (4) An uprooted soybean plant, showing nodules on the roots, and abundant pods (p. 12). (5) Comparison of two soybean plants, with and without nodules. The one with nodules is larger and has many more and larger pods (p. 13).

Note: This is the earliest document seen (Feb. 2001) concerning soybeans in Portugal, or the cultivation of soybeans in Portugal. This document contains the earliest date seen for soybeans in Portugal, or the cultivation of

soybeans in Portugal (1880 at the botanical garden in Coimbra). The source of these soybeans is unknown. Address: Catedrático de Agricultura de Instituto-Escuela, Spain.

235. Udo, Shigezo. 1936. Nattô no seibun ni tsuite. I. Nattô-chû ni jibikorin-san no sonzai to sono eikyô [Studies on the constituents of natto. I. On the occurrence of dipicolinic acid produced in natto and its influence]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 12(5):386-94. May. (Chem. Abst. 30:6887). English-language summary in *Bulletin of the Agricultural Chemical Society of Japan* 12(5):55-56, bound in the back of *Nippon Nogeï Kagaku Kaishi*. [8 ref. Jap; eng]

• **Summary:** Udo isolated an organic acid from the ether soluble fraction of natto and identified it as dipicolinic acid. He also found that this acid did not exist in the soybean and was produced by *B. subtilis* (natto) at concentrations of 0.3% to 0.8% and that this acid prevented the growth of many microorganisms.

Accumulation of dipicolinic (pyridine-2,2'-dicarboxylic) acid to a concentration of 1.2-1.5% completely suppresses the growth of *Bacillus natto*, which is also partly inhibited by the viscous substance produced around the soya-bean grains. The growth of *B. subtilis* and of *Penicillium glaucum* is also inhibited by dipicolinic acid. Address: Morioka Koto Norin Gakko, Nogeï Kagaku Kyôshitsu (Agricultural College of Morioaka, Japan).

236. Arima, Shizuka. 1936. Nattô-kin to sekiri-kin to no kikko sayo ni kansuru jikken-teki kenkyû. I. Shiken-kan nai jikken [Investigations on the antagonistic relationship between natto bacteria and dysentery bacteria. I. In vitro (test-tube) experiments (Abstract)]. *Kaigun Gun-ikai Zasshi (Bulletin of the Naval Medical Association)* 25(8):509-27. Aug. 15. [27 ref. Jap]

• **Summary:** Describes studies on the antagonism between *Bacillus natto* and *Shigella*. Address: Kaigun Guni-Gakkô, Bôekigaku Kyôshitsu (Shunin Shibata Kyôkan).

237. Arima, Gen. 1936. Nattô-kin to sekiri-kin to no kikko sayô ni kansuru jikken-teki kenkyû. I. Shiken-kan nai jikken [Investigations on the rival or antagonistic relationship between natto bacteria and dysentery bacteria. I. Test tube experiments (Abstract)]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 12:A260. [1 ref. Jap]

• **Summary:** Abstracted from *Kaigun Gunikai Zasshi* 25:509-527 (1936, Aug). Describes studies on the antagonism between *Bacillus natto* and *Shigella*.

238. Hanzawa, Jun. 1936. Nattô seizô-hô [Natto production methods]. Sapporo, Hokkaido, Japan: Sapporo Natto Yoki Kairyo-kai. [Jap]\*

239. Read, Bernard E. 1936. Chinese medicinal plants from the "Pen ts'ao kang mu" of 1596. 3rd edition of a botanical, chemical and pharmacological reference list. Peking, China: Peking Natural History Bulletin. Sales Agent: The French Bookstore. xvi + 391 p. See p. 114-18.

• **Summary:** Contents: Introduction in Chinese. Introduction to the third edition (Shanghai 1935). Provincial abbreviations. Abbreviations for parts of plants. Bibliographical abbreviations (journals and books). Secondary references helpful to a study of Chinese materia medica. Comparative table of Western, Japanese, and Chinese dates (1868-1935). Table of classes, general, and species for which references are listed. Index of Romanized Chinese names modified from Wade's system. Index of common English names, with foreign names given in italics. Latin index.

References related to soybeans are subdivided as follows (p. 114-18, 256): Soybeans, black variety (var. *nigra*; the fresh hulls used in medicine are known as *Ta Tou P'i*). Soybean sprouts, black variety (*Ta Tou Huang Chüan*). Bean relish, black variety (*Ta Tou Ch'ih*). Bean ferment, black variety (*Tou Huang*; *Natto* in Japanese). Yellow soybean (*Glycine soja* S. et Z., var. *flava*; *Huang Ta Tou*). Soybean oil (*Tou Yu*). Soybean sauce, yellow variety (*Chiang Yu*; thick or thin). Soybean paste (*Chiang*). Bean curd, yellow variety (*Tou Fu*). White soybean (*Glycine soja*, S. et Z., var. *alba*). Soy sauce made with wheat flour (p. 256).

References for azuki beans (red mung bean, *P. mungo*, L. var. *subtrilobata*, Fr. et Sav. [HN. Br.]) are given on page 122. References for wheat gluten (*Mien Chin*) are given on page 256.

This book is largely a list of references relating to plants listed in the *Pen Ta'ao Kang Mu*. It is not a translation or summary of the latter work.

Note: This is the earliest English-language document seen that uses the term "the fresh hulls" to refer to soy bran. Address: PhD, Head of the Div. of Physiological Sciences, Henry Lester Inst. of Medical Research, Shanghai, China.

240. Rouest, Leon; Guerpel, Henry de. 1936. *Le soja français et ses applications agricoles et industrielles* [The French soybean: Its agricultural and industrial applications]. Chateauroux, France: G. Langlois. xxiii + 99 p. 28 cm. [42 ref. Fre]

• **Summary:** Contents: Preface, by L Brétignière (Prof. at Grignon, Member of the Academy of Agriculture). Preface to the first edition, by Louis Forest (1921). Introduction to this new edition: Soviet Russia and the soybean (*le Soja*; includes the story of Rouest's stay in the Northern Caucasus, Russia, from 1930 to 1933), Germany and Poland take up the soya question, the canons [guns] of Germany versus the Manchurian soybean, a secret contract to provide the weapons of war, organization of a Polish bank in Manchuria,

Germany cultivates soybeans in Romania and Bulgaria in preparation for the war, France and the cultivation of soybeans.

1. What is soja? 2. History of the propagation of soja: Introduction of the soybean into France and Europe, the soybean is cultivated in central Europe, in Austria, in 1875, in France the soybean is the object of numerous trials from 1876 to 1881, its cultivation worldwide, the study and acclimatization of soya become generalized.

3. Botanical characters of the soybean: And the varieties of soybeans. 4. Chinese varieties: The soybean in China, the production of soya in China in 1916 and 1917, production of soya in the Far East during the year 1928, exportation of soya from the Far East to Europe.

5. Japanese varieties: The soybean in Japan, varieties of soya from Indochina and from other Asian countries. 6. The soybean in America: American varieties, cultivation of soybeans in Ohio, selection of soya using pure lines in Connecticut.

7. The soybean in Europe: Italy, Russia, France, French climatic zones for the cultivation of *Soja hispida*, the Atlantic zone, the continental zone, the Mediterranean zone and climate, can the soybean be cultivated in all the French climates including those in the north, northeast, and northwest, speedy production of soybeans in view of agricultural production and of the creation of early varieties for the regions in north and northeast France.

8. Instruction for growing soja in France. 9. Soja in Manchuria. 10. Soja seeds. 11. Selection of soja. 12. Varieties of soja. 13. Different ways of planting soya seeds. 14. Soy yield. 15. Nitrogen fixation in soya seeds. 16. Tilling and preparing the earth. 17. Soja fodder. 18. Soja, striking and improving. 19. Harvesting soja grain. 20. Soja oil. 21. Soja oil-cake for animal feeding. 22. Vegetable milk, soja milk and industrial casein.

23. Soja in human food: Soy flour and its applications, soy bread with wheat, nutritional composition of soja compared to dry legumes, soy viewed as a dry legume to replace meat, comparative production of nutritive elements among the various legumes used for human food, comparative value in calories of the usual foods and of soja, preparation of soy soups and meals in compressed tubes, what varieties of soy can serve the special needs of human nutrition, Sojenta, potatoes stuffed with soy, force meat balls (*boulettes*) of rice and soy, bread of rice and soy, pudding of soy and rice, soy sprouts and their food value, fresh soy sprouts in a salad, soy sprouts with vegetables, soy preserves and confections, soy chocolate, soy coffee, soybeans conserved in containers, soy with smoked fish, soup with soy vegetable meat, soymilk soup, omelet with smoked soy vegetable ham, green soy sprouts, soy cake, soy force-meat fritters.

24. The utilization of soja in the Far East: Vegetable cheese (tofu), soy-based condiments, Japanese natto (2

types), Japanese miso, Chinese miso, soy sauce (*soyou* or *schoziou*), making soy sauce in Kwantung, China, making soy sauce in Japan, koji or molded rice.

25. The culture of soja in North Africa (Rouest has varieties that would grow and yield well in the French colonies of Tunisia, Algeria, and Morocco). 26. Opinions of some authors on soja. Conclusions. Bibliography on soja.

A small photo on the "Dedication" page shows Léon Rouest (born in Paris on 11 Nov. 1872).

Concerning soy in Russia (USSR) (p. 52-53): In Russia, the soybean has been known for quite a long time, specially in the Ukraine and Bessarabia, but it was never grown over a large area, and was given a back seat (low priority) in agriculture until after the revolution of 1917. It was not until 1926-27 that cultural trials were conducted on farms in the state of Northern Caucasus (*d'Etat du Caucase du Nord*). In the regions of Rostov-on-Don (*Rostow-sur-Don; Rostov-na-Donu*), Eisk (near Krasnodar), Stavropol, Prim-Koumsk, Yessentuki / Essentuki in the Kuban and Kuban River area of the North Caucasus region of southern Russia, the yields were 11 to 16 quintals.

In 1927 there were 600 ha planted to soybeans, increasing to 17,000 in 1928, in the *kolkhoz* (collective) farms or the *sovkhos* (state owned) farms.

In 1929-1930 and until 1932-1933 there were very laudable / praiseworthy efforts to propagate soybeans in favorable regions, especially in the North Caucasus, but the soils of this region, although they are very rich and well suited to soybeans are also very rich in bad weeds and the results obtained up to the present do not seem favorable. As I said earlier, the soybean is a technical plant of the intensive type which is well suited to the soil and climate of Russia, but is much less suited to the indolent character of peoples who are accustomed to cultivating only small areas. In spite of the remarkable efforts at mechanization, the peasants who submit to collectivization and who do not yet understand it very well, the cultivation of soybeans does not assume the importance hoped for. Address: France.

241. **Product Name:** Natto.

**Manufacturer's Name:** Yoneuchi Natto Seizo-sho (Yoneuchi Natto Mfg. Co.). Renamed Yonai Natto Seizo-sho by 1940.

**Manufacturer's Address:** 3480 E. 4th St., Los Angeles, California. Phone: ANgelus 14457.

**Date of Introduction:** 1937. January.

**New Product-Documentation:** The Japanese American Directory. 1937. p. 320. In Japanese: Natto Seizō-sho (Yoneuchi). In English: "Natto (Yoneuchi), 3480 E. 4th St." Phone: AN. 14457.

Note: This is the 3rd earliest known commercial natto made in the United States.

Also in 1938, p. 348. The company name is written only in Japanese (the same as in 1937), not in English. Also

in 1939, p. 339. The same characters are now written in a different order: Yonai Natto Seizô-sho. In English: "Natto (Yonai)..." Thus the same characters previously pronounced "Yoneuchi" are now pronounced "Yonai." Also in 1940, p. 326-27. Listed in the category "Foodstuff Factory." In characters: Yonai Natto Seizô-sho. In English: Yonai Natto Mfg. Co., 3480 E. 4th St., Los Angeles, California. Phone: ANgelus 14457. Also in 1941, p. 328.

242. Go, Yukichi; Nakamura, Seiji. 1937. Saikin no nenshitsu-butsu seisei ni kansuru kenkyû. I. Kakushu nattô seisei-kin no bunrui [Studies on the creation of mucilaginous matter by microorganisms. I. Classification of natto microorganisms]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 13(4):295-304. April. [7 ref. Jap]  
Address: Osaka Teikoku Daigaku, Rigaku-bu, Japan.

243. Kale, F.S. 1937. Soya bean: Its value in dietetics, cultivation and uses. With 300 recipes. 2nd ed. Baroda State, India: Baroda State Press. xxx + 375 p. Illust. (35 leaves of plates, described in a separate record). Index. 22 cm. 2nd ed. 1937. [66 ref]

• **Summary:** Contents: 1. Deficiencies in the Indian diet and soya bean as a means to rectify them. 2. History of the origin and growth of soya bean: Derivation of the word soya bean, origin of soya bean, literature, primitive man and soya bean, name of the plant, home of soya bean and its expansion, varieties of soya bean, the culture of soya bean is very remote (It "has been the chief article of diet in China for over 7,000 years."), reference of soya bean in old Chinese records, how and when soya bean became known to Europeans, soya bean in England (from 1890; J.L. North and Henry Ford), soya bean in France (from 1739), soya bean in Italy, soya bean in other countries of Europe, soya bean in United States of America, India and soya bean.

3. The use of soya bean: Importance of soya bean, dietetic importance, industrial importance, agricultural importance (Russia, Mussolini in Italy), medical importance, soya bean is alkalising in its effect ("Soya bean milk as well as its flour is used in foods for invalids and infants, like Nestle's food"), longevity and soya bean.

4. World trade in soya bean: Imports to Europe, production of soya bean in Manchuria (58% in North Manchuria), exports from Manchuria, oil and cake industry in Manchuria, soya bean production in Japan, in America, in Africa, in Australia, in Europe, in Java, in India, in other British possessions, estimate of world production of the soya bean, the desirability of the expansion of soya bean cultivation, imports and exports of soybeans, soya bean oil, and soya cake—1913-1927: Denmark, Holland, United States, Great Britain, Japan, France, Russia, China, Germany, Norway, Korea. Source: International Institute of Agriculture, Bureau of Statistics, 1921, p. 420-21. A table

(p. 38) shows statistics for world production of soybeans "as estimated by the leading firm of London soya bean dealers" for various years from 1923 to 1929. This includes individual statistics each year for China [incl. Manchuria], Japan, and USA. The world totals in tons are: 3,095,000 (for 1923-25). 3,397,000 (for 1926). 4,325,000 (for 1927). 6,000,000 (for 1928), and 6,570,000 (for 1929; incl. China 5,250,000; Japan 550,000; USA 250,000; Java & Dutch East Indies 120,000; Other Asiatic countries & Africa 400,000).

5. Botany of the soya bean plant. 6. Classification of soya bean. 7. Cultivation of soya bean. 8. Diseases and pests of soya bean. 9. Cultivation of soya bean in India. 10. The constituents of soya bean. 11. Soya bean milk. 12. Soya bean flour. 13. Industrial uses of soya bean. 14. Enriching soil by addition of nitrogen and use of soya bean as fodder. 15. Food requirement of the human body. 16. European and American soya bean recipes. 17. Diabetic dishes, Mahatma Gandhi's experiments at Magan Wadi and opinion of scientists on soya bean. 18. Chinese and Japanese soya bean dishes: Toffu [tofu] or soya bean curd: Digestibility, utilization, toffu khan, toffu nao, tze toffu (fried bean curd), chien chang toffu (thousand folds), hsiang khan, kori toffu (frozen toffu), preservation of toffu. Natto. Tokio natto and Kyoto natto etc. Hamanan natto [Hamanatto]. Yuba. Misso [miso]. Soya sauce. Soya bean confectionery. Roasted beans (Chinese).

19. Indian soya bean dishes: Hindustani dishes, Moglai dishes, Gujarati dishes, Maharashtrian dishes, Bengali dishes, Goa dishes, Tanjore dishes. Appendixes. 1. Acreage of soya bean in Manchuria during the last 5 years. 2. Total figures of export during last 5 years. 3. Bibliography. 4. Some opinions about the first edition of this book.

The preface begins (p. iii): "This little book is written in response to innumerable inquiries I have had from time to time after the inauguration of the plantation ceremony of Soya Beans at the State Agricultural Experimental Station by H.H. the Maharaja Gaekwar of Baroda in November 1933.

"A few months after this a food exhibition was held in Baroda where many Soya Bean dishes—Indian, European and Chinese—were exhibited. The leading papers and journals all over the country spoke in very glowing terms about the Soya Bean dishes that were exhibited... Later on at the request of Messrs. Mitsui Bussan Kaisha Ltd., a leading Japanese Firm in Bombay, a Soya Bean Exhibition and Restaurant were run in the Japanese village at the H.O.H. fete. So keen was the interest and enthusiasm evinced by the cosmopolitan public of Bombay that seats in the restaurant had to be reserved in advance. The presence of H.E. the Governor and Lady Brabourne and many Indian princes was an additional evidence of the ever growing popularity of the tasty Soya Bean dishes served there.

"At the closing of the H.O.H. fete many prominent people of Bombay requested me to continue the restaurant at a convenient place in the city, and asked me to open soya-bean milk centres for the children of the poor who could not

afford to buy cow's milk. Many were ready to finance any scheme that I would propose, but unfortunately my time was not my own as I had to attend to my duties in the State and could not take advantage of their generous offer.

"The Departments of Agriculture of the various provinces of India as well as many Indian States asked me to supply them with literature regarding the cultivation and the uses of this most useful bean. The Department of Commerce and Industry of the Government of Bombay inquired if I could furnish them with information about the machinery for the extraction of Soya-bean milk. Letters of inquiries from private individuals kept pouring in daily from all parts of India. All this has induced me to undertake the preparation and the publication of this book...

"From the number of experiments carried on in the Baroda territories and outside it, I feel sure that the Indian soil is most suitable for the cultivation of soya bean...

"The leading thought of the day in India is, 'Village uplift,' and 'Rural reconstruction.'

"Baroda, 7th January 1936, F.S.K. (p. iv)

"Preface to the Second Edition: I feel grateful to the public for having given such a hearty reception to the first edition of my book. It is running into a second edition within a year...

"Now, Soya Bean Bakeries and Restaurants have been started in the city of Bombay and in many other towns in India, and Soya Bean products are exhibited in almost all the exhibitions...

"I feel highly thankful to His Highness the Maharaja of Baroda who gave me an opportunity last year of visiting Russia, where I have seen that seven to ten per cent. of Soya Bean flour was being added to the wheat flour in order to enhance the nutritive value of the bread. The Soya Research Institute at Moscow is making researches into the nutritive, industrial and economical values of Soya Bean. I have seen there the actual working of the Soya-bean milk extracting plant. They make casein out of Soya-bean milk. Soya-bean cream is sold in the market.

"I visited the dietetic clinics in England, France, Germany, Austria and other European countries, where doctors prescribe Soya Bean bread for diabetic patients. In Russia, rickets and consumption are treated by Soyolk extracted out of Soya Bean...

"France is growing Soya Bean on c<sup>o</sup>lt de jura [sic, C<sup>o</sup>te d'Azur, on the Mediterranean?]. In England, through the efforts of Mr. J.L. North, Soya Bean is realised as a field crop for the last two years.

"Paris, 3rd April 1937. F.S.K. (p. ix)." Address: Food Survey Officer, Baroda State, India.

244. Woertge, Karl Heinz. 1937. Entwicklung und weltwirtschaftliche Bedeutung der Sojabohnenerzeugung und -verarbeitung [Development and international economic significance of soybean production and processing]. Thesis,

Friedrich Alexander University, Erlangen, Coburg, Germany. 119 p. 28 cm. [112 ref. Ger]

• **Summary:** Contents: Foreword. Part I: History and culture of the soybean. 1. History, natural requirements and technology of soybean production; chemical composition of the soybean. 2. Occurrence of the soybean and methods of production in various countries: Asia (Manchuria and China, Japan, Korea, Formosa, Dutch East Indies, other Asian countries incl. British India, Cochin China, Ceylon), America, Europe (Southeast Europe, Austria, USSR, France, Italy, England, Poland, Switzerland, Czechoslovakia, Germany), Africa and Australia.

Part II. Scale and global economic significance of soybean production in the main producing areas. 1. General overview of world soybean production: Production for seeds, for fodders. 2. Scale of soybean production in the main producing areas: Asia (Manchuria, Japan, Korea, Formosa, Dutch East Indies [Java and Madura/Madoera]), America, Europe (Southeast Europe, USSR).

Part III. Development and global economic significance of soybean processing. 1. Soybean processing possibilities: A. Processing soybeans to make foods: Asia (general, methods used in China and Japan to make vegetable-type soybeans and salads, koji, soymilk, shoyu [soy sauce], miso, natto, tofu, methods used in the Dutch East Indies), Europe (general overview, preparation of soybean meal, soymilk, coffee- and chocolate substitutes). B. The soybean as an oilseed: General, methods of obtaining the oil (in Asia, Europe, USA), use of soy oil (as human food, other). C. Obtaining lecithin from the soybean. D. Use of soybean press-cake for livestock feed. E. Use of the soybean meal for fertilizer. 2. World trade in soybeans, soy oil and soybean cake/meal (*Sojakuchen/Sojaschrot*): World trade in soybeans (Manchuria, Asia, Europe, USA), world trade in soy oil, world trade in soybean meal.

Closing remarks: The state of the world soybean market with special consideration for the current German conditions. Appendixes and tables. Address: Nuereberg, Germany.

245. Saitô, Tsutomu. 1938. Nattô-kin no "chifusu" kin ni taisuru kikkô sayô ni tsuite [Antagonistic action of natto bacteria toward typhus bacteria]. *Hokkaido Igaku-Acta Medica Hokkaidonensia (Hokkaido J. of Medical Science)* 16(1):82-92. Jan. [8 ref. Jap]

• **Summary:** Reported the inhibitory effect of *Bacillus natto* against the typhoid bacterium. Address: Hokkaido Teikoku Daigaku, Igaku-bu, Eisei-gaku Kyôshitsu (Shunin, Inoue Kyôju) (Hokkaido Imperial Univ.).

246. Yamazaki, Momoji; Kawamata, Tôzô. 1938. Nattô kin no baiyô [Cultivation of natto bacteria]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 16(4):291-313. [Jap]

247. Yamazaki, Momoji; Kawamata, Tôzô. 1938. Nattô kin



no baiyô-Zoku [Cultivation of natto bacteria—Continued]. *Jozogaku Zasshi (J. of Brewing, Osaka)* 16(5):446-59. [Jap]

248. Hutchinson, C.M. 1939. Home-grown food in war time: A direct method of production (Letter to the editor). *Times (London)*. May 16. p. 10, col. 1.

• **Summary:** In Japan, the peasant has long “been largely dependent on the soy bean as his principal source of protein food, and his relative physical energy and powers of endurance as compared with the natives of other Oriental countries, such as India, who are also largely vegetarians, are well known. This difference is not due to the absence of legumes in India nor because the soy bean is not cultivated in the latter country, but to the fact that the Japanese are acquainted with a method of preparing this vegetable for human consumption in a manner which not only renders its palatable but highly digestible and nutritious.

“In place of cooking in the ordinary manner of the bean it is boiled and crushed and the resultant mash inoculated with a ferment which in the course of a few days converts it into a vegetable cheese, known as natto; this process of fermentation is actually one of predigestion which peptonizes and thus renders assimilable the whole of the vegetable protein in the bean so that no strain is thrown upon the digestive processes of the consumer.”

There is no reason why this fermentation process should not be applied to beans grown in England.

Note 1. This is the earliest document seen (Jan. 2009) that mentions soy beans during World War II. This war would have a huge impact on production and utilization of soybeans worldwide.

Note 2. Aldeburgh is on the east coast of England, northeast of London, about midway between Lowestoft and Harwich. Address: Alde End, Aldeburgh.

249. Hanzawa, Jun. 1939. Nattô [Natto]. In: *Kôso Kagaku Kôgyô Zenshu (Complete Enzymological Industry)*. Tokyo: Koseikaku. [Jap]\*

250. Matagrín, Am. 1939. *Le soja et les industries du soja: Produits alimentaires, huile de soja, lécithine végétale, caséine végétale [Soya and soya industries: Food products, soy oil, vegetable lecithin, and vegetable casein]*. Paris: Gauthier-Villars. x + 390 p. 18 cm. [300 ref. Fre]

• **Summary:** Contents: Introduction. 1. The agricultural, industrial, and commercial history of soya: Asiatic origins and propagation in Europe, soya in America (its cultivation and industries), soya in Europe, Asia, Africa, and Oceania (1936) (1. Admission of soya in the agriculture and industry of European nations (p. 35): Soya in France, soy industry and commerce in central and northern Europe {England, Germany, Holland, Denmark, Sweden, Poland, Austria and Hungary, Switzerland}, penetration of soya into southern Europe {Iberian peninsula, Italy, Balkan

countries of Dalmatia, Istria, Yugoslavia, Greece (p. 47), Bulgaria, Romania, Ukraine}, the grandeur and decadence of soya in Russia. 2. Soya in modern Asia (p. 51): China and Manchuria, Japan, Korea, Formosa, French Indochina {Tonkin, Cambodia, Cochin China}, the British and Dutch Indies {Siam, Assam, Bengal, Burma, Ceylon, India, Straits Settlements [later Singapore] / Malacca}, western Asia {Turkestan, Persia (p. 57)}. 3. Soya in Africa and Australia (p. 57-58): South Africa, Rhodesia, Nigeria, Gold Coast [later Ghana], Cote d'Ivoire, Dahomey, Togo, Algeria, Tunisia, Morocco, Egypt, Australia {Queensland, New South Wales, Victoria}, Tasmania, New Zealand, not yet in British New Guinea [later Papua New Guinea], Philippines, Java).

2. The botany and agronomy of soya: The plant, its names, its botanical characteristics, its varieties (original and created by selection), the cultivation of soya. 3. The general chemistry of soya: Chemical composition of the plant, structure and chemical composition of the beans. 4. Using soya in soyfoods and soyfood products: Whole soybeans (fresh, dry, sprouted, roasted and salted (*Fève grillée, fève salée de soja, fèves de soja salées*, p. 166-67), soynut butter (*un mélange rappelant les beurres végétaux*), soy coffee, soy confections, soy chocolate, soy sprouts), soymilk and tofu (*le lait et le fromage de soja*), okara (*pulpe résiduaire de la préparation du lait de soja*), fermented soy products (solid, paste, and liquid condiments; natto, miso, and shoyu [soy sauce]; kiu-tsee and lactic ferments), soy flour and bread. 5. The soy oil industry and products derived from it: Extraction and refining of soy oil, properties and use of soy oil. 6. The vegetable lecithin industry: Extraction of vegetable lecithin, properties and use of vegetable lecithin. 7. The vegetable casein industries and plastic materials based on soya: Soybean cakes and flours from which the oil has been removed, use of such cakes and flours, in the crude state, as a raw material for plastics, manufacture and use of vegetable protein, soybean cellulose for artificial silk, soya furfural and furfuraldehyde (phenolic resins). Conclusion: How to launch soya industries in France. important terms:

Note 1. This is the earliest French-language document seen that uses the terms *Fève grillée, fève salée de soja*, or *fèves de soja salées*, “roasted soy beans” to refer to soynuts.

Note 2. This is the earliest French-language document seen (April 2005) that mentions soynut butter, which it calls *un mélange rappelant les beurres végétaux*. Address: France.

251. **Product Name:** Tofu, Agé, Miso, Natto, Okara.

**Manufacturer's Name:** Harada Tofu, Zakka-ten.

**Manufacturer's Address:** P.O. Box 180, Fowler, California.

**Date of Introduction:** 1939?

**New Product—Documentation:** The Japanese American Directory. 1941. p. 283. Harada (Gonshiro) Tofu-ya (in Japanese). Harada, G., P.O. Box 180 (in English), Fowler, California. Phone: Not listed. This listing is in the

“Residence” section, so the owner’s first name is Gonshiro.

Talk with Brad Kubota, owner of Fresno Tofu Co. 1990. Dec. 4. He has heard from Japanese-American old-timers living in Fresno that there were two tofu shops in Fowler before World War II. Fowler is located about 10 miles southeast of Fresno.

Letter from Masakazu Iwata of Montebello, California. 1995. In 1939 Gonshiro Harada (died 1943), an Issei (first-generation Japanese immigrant to the USA) relocated from Fresno to Fowler, about 10 miles southeast of Fresno. There he and his wife and family (nine children) established the Harada Tofu Co. and manufactured such foods as tofu, kamaboko, agé, miso, natto, okara, and other related items, peddling them to the Japanese farmers in a broad area of Central California.

Note: This is the 4th earliest known commercial natto made in the United States.

252. Japanese American News Inc. / Nichi-Bei Shinbunsha. 1940/01. Nichibei jûshoroku [The Japanese American directory. No 36]. San Francisco, California: Nichi-Bei Shinbunsha; The Japanese American News. 688 p. Jan. 1. Index of cities. 23 cm. [Eng; Jap]

• **Summary:** On p. 7, under “Food products manufacturers,” are listings (name, address, phone no.) in San Francisco for: Azumaya Co., Fujimoto Co., Umino Tofu Mfg., and Norio Co. On the facing page is a full-page ad for Fujimoto Co., importers, manufacturers & exporters, 246 Front St., San Francisco. The company makes miso, koji, and pickled salmon (*sake tsukemono*). They sell tofu ingredients (presumably soybeans and nigari). Address: 350 Ellis Street, San Francisco.

253. Senbon, S. 1940. Anwendung des *Bacillus natto* zur Therapie gegen Tricophytia [Utilization of *Bacillus natto* as therapy against tricophytia]. *Medical J. of Taiwan* 39:14-17. [Ger]\*

• **Summary:** *Bacillus natto* were found to have a beneficial effect in treating human infections caused by two species of trichophytia.

254. Japanese American News Inc. / Nichi-Bei Shinbunsha. 1941/01. Nichibei jûshoroku [The Japanese American directory. No 37]. San Francisco, California: The Japanese American News Inc. (Nichibei Shinbunsha). 720 p. Jan. 1. Index of cities. 23 cm. [Eng; Jap]

• **Summary:** Contents: Ads (in Japanese and English, p. A-1 to A-22). Directory of Japanese embassy, consulates, and legations in the USA and Latin America (in Japanese and English, p. A-22). Key addresses in Japan (in Japanese, p. A-23 to A-27). Index to the 1941 Japanese American Directory, by nation (USA and Latin America), and within nation by state, then by city (p. A-28 to A-31). One-page ad for Kirin Beer (p. A-32).

Directory by nation (USA and Latin America), and within nation by state, then by city (p. 1 to 686). There are many smaller ads on the lower half of quite a few directory pages, for a company listed on that page. For cities having many Japanese businesses (such as San Francisco and Los Angeles), a table of contents to the business in that city, organized alphabetically by type of business, is given in Japanese on the first page concerning that city (For example, Shokuhin seizô-sho = food manufacturers). Between pages 303 and 305 are 6 pages of ads (B-1 to B-6) for Japanese American companies located in Los Angeles. Publisher / publishing information (p. 686). A (in Japanese and English, p. 687-688 + inside rear cover and rear cover). On the front cover (which is mostly in English and is at the “back” of the book) is an illustration of the Golden Gate Bridge, below which are America and Japanese flags with an illustration of the dome of city hall between them. In the center, vertically in Japanese characters is written *Nichibei Shinbun-sha*.

Note 1. Within each city, all businesses are listed under basic bold headings (in both Japanese and English) such as Food Products Manufacturers (where most soyfoods manufacturers are listed), Importers & Exporters, Importers & Groceries, Brewery, Rice Mill, Farm Produce Buyers, Seeds and Fertilizer Cos., Insurance Agents, etc. For each entry / listing is given the company name, address, and phone number; the company name is given in both Japanese characters and English (romanized), whereas the address and phone number are only in English. The last bold heading in each city is Residence; all people of Japanese ancestry are listed alphabetically by family name. For each person is given his or her name, address, and phone number. The full name is given in Japanese characters; the family name plus the first letter of the first name is given in English (romanized).

Note 2. For each major city, a table of telephone number prefixes is given on the first page for that city. For San Francisco, for example: AT = ATwater, BA = Bayview. CH = China. These are useful when dialing long distance using an operator. The many directory listings for soyfoods manufacturers and ads for soy-related companies are each given separately.

Note: We can find no entries for soyfoods makers in Latin America or other U.S. states. Address: 650 Ellis Street, San Francisco, California.

255. Roux, Charles. 1941. Le soja [The soybean]. *Revue Internationale du Soja* 1(1):4-20. Feb. [Fre]

• **Summary:** An introduction and overview. Contents: Introduction: Varieties, composition. Soybean cultivation. Feed, food, and industrial uses of soybeans.

The author has recently discovered a way of making petroleum from soybeans (p. 18). Address: Directeur General de l’Association Technique Africaine.

256. Roux, Charles. 1941. Le soya [The soybean]. *Revue Internationale des Produits Coloniaux et du Material Colonial* 16(181):8-25. March. [Fre]

• **Summary:** Contents: Introduction. Chemical composition. Cultivation. Food and industrial uses of soybeans: Incl. soymilk, tofu, soya casein, soy flour, soy bread, soy oil, soybean cake, green vegetable soybeans, fermented soy condiments (natto, miso, shoyu), roasted soy coffee, industrial uses, petroleum substitute.

Appendix A: Composition of various parts of the soybean plant: (1) Green—stems, leaves, pods. (2). Dry—stems, leaves, pods. (Averages based on analyses by M. Lechartier). (3) Composition of soybean seeds: Whole seeds, cotyledons, embryos, seed coats (based on analyses by the Municipal Laboratory of Paris and the Laboratory of the Biological Society of the Far East {*la Société Biologique d'Extrême-Orient*}).

Appendix B. Composition of the seeds of various soybean varieties by various analysts: Steuf, Pellet, By Steuf: From Hungary, Yellow from Mongolia, From China, Chinese reddish brown. By Pellet: From China, from Hungary, from Etampes. By Giljaransky [Giliaranskii, Giljarinsky, Giljaranskii, Giljaranski, Gilyaranskii, Gilyaranskii]: Yellow from Russia, Yellow from China, Yellow from Japan, Black from China, Black from Japan, Green from Japan. By Lechartier: From Etampes, Etampes dry, Black, Black dry. By Jardin Colonial: Soja from Laos, Soja from Tonkin, Soja from China. By Schroeder: Reddish brown dry, Yellowish brown dry, Tumida pallida yellow. By König: Tumida castanea brown, Tumida astrospermal [sic, atrosperma] black.

Appendix C. (1) Composition of soybeans (maximum and minimum) compared with four other legumes. (2) Composition of soybeans and beef compared. (3) Composition of soy flour and wheat flour compared. Address: Director General of the Association Technique Africaine.

257. Weiland, P. 1941. Untersuchung ueber die bakterizide Wirkung von Mesentericusfiltraten gegenueber Diphtheriebazillen [Investigation on the bacteriocidal effect of Mesentericus filtrate against diphtheria bacteria (bacilli)]. *Zentralblatt fuer Bakteriologie. 1 Abt. Originale* 147(5):321-34. Aug. 1. [15 ref. Ger] Address: Aus dem Hygienischen Institut der Universitaet Bonn.

258. Guillaume, A. 1942. L'utilisation du Soja dans l'alimentation et dans l'industrie [The utilization of soybeans in food and industry]. *Revue de Botanique Appliquée & d'Agriculture Tropicale* 22(247-248):191-97. March/April. [7 ref. Fre]

• **Summary:** Contents: Introduction. Food uses: Whole soybeans, soy sprouts, soy coffee, soy milk, tofu, shoyu,

miso, natto, soy flour. Industrial uses: Soy oil, Henry Ford and hexane solvent extraction, lecithin, soybean cake, animal feeds, plastics, green forage. Address: Professor, Univ. of Strasbourg.

259. Giraud-Gilliet, J. 1942. Le soja, aliment d'avenir: manière de le cultiver; 2 à 300 façons de le consommer [Soya, food of the future: How to cultivate it; 200-300 ways to consume it]. Saigon: Imprimerie de C. Ardin. 285 p. Index. [Fre]

• **Summary:** Contents: Dedication. Introduction. Part I: Summary study of soya (the soybean): Its cultivation. 1. The nature of soya: Its area of expansion. 2. Cultivation of soya: Soil, manure & fertilizer, seeds. 3. Interest in soya: Its richness in nutritive elements and comparison with other foods. Various possibilities for utilization: therapeutic uses for hygiene and diseases (vegetarian diet, diabetes, beriberi, diseases of the nervous system, anemia, slimming, milk diet), agricultural uses for fixation of nitrogen in the soil and as a fertilizer, use in the feeding of animals (green forage, dry forage, soybean cake, flour, seeds, germinated seeds, straw and pods, soymilk, milk), industrial utilization (soybean oil and its derivatives, glycerine, soy casein), use as human food (whole dry soybeans, soy sprouts, soybeans mashed or ground after they are cooked, soybeans cracked or crushed before they are cooked, fermented soybeans, soymilk, soymilk derivatives / foods made from soymilk {tofu / *dâu-phu*, yuba / *tao hu ky*, dry yuba rolls / *phu chuc*, beverages}, edible oil), utilization for social work (drops of milk, bowls of soya, inexpensive restaurants, battle against malnutrition and degeneration, for school gardens, pagodas, waste lands).

Part II: The main soyfood products and how to prepare them at home. 1. Soymilk, soymilk curds (*tau hu hoa*), small white cheeses (*petits fromages blancs* {*dâu-hu miêng*}), folded sheets of yellow yuba (*feuille jaune plissée de crème de soja* {*dâu-hu ky vang*}), white sheets of yuba (*feuille blanche unie* {*dâu-hu ky trang*}), dried or smoked yuba (*plquettes séchées ou fumées* {*dâu-hu ky ngot*}), fermented tofu-like cream cheese (*fromages fermentées: cancoillotte comtoise au soja*). 2. Soy flour: Roasted soy flour, soy bread, sojenta (soy polenta), pasta (soy vermicelli and vermicelli of mung beans {*dâu xanh*} or *song than*). 3. Soy condiments. Solid condiments: natto and douchi (*taotché*), condiments that are pastes: miso and doujiang (*tao tjiung*) and koji [sic, not a paste but used to make miso, doujiang, shoyu, and jiang-you], liquid condiments: shoyu, jiang-you (*tsiang yeou*), (*tao yu*), ketjap (Indonesian soy sauce), Vietnamese soy sauce (*tuong*).

Part III: Recipes. 1. Introduction: Essential recommendations, the cookery of the poor, comparative cuisine, general recipes. 2. Soups and paps. 3. Hors d'oeuvres and salads. 4. Vegetables. 5. Meat, fish and egg dishes. 6. Breakfasts, sweets, and desserts.

Conclusion. Appendix. Errata. Address: Administrateur

des S.C. de l'Indochine; Vietnam.

260. Rouest, Antoine. 1942. *Le soja français* [Soya in France]. Argenton, France: Langlois. 48 p. Preface by J. Bordas. [9 ref. Fre]

• **Summary:** Contents: Preface, by L Brétignière (Prof. at Grignon, Member of the Academy of Agriculture). Preface to the first edition, by Louis Forest (1921). Introduction to this new edition: Soviet Russia and the soybean (*le Soja*; includes the story of Rouest's stay in the Northern Caucasus, Russia, from 1930 to 1933), Germany and Poland take up the soya question, the canons [guns] of Germany versus the Manchurian soybean, a secret contract to provide the weapons of war, organization of a Polish bank in Manchuria, Germany cultivates soybeans in Romania and Bulgaria in preparation for the war, France and the cultivation of soybeans.

1. What is soja? 2. History of the propagation of soja: Introduction of the soybean into France and Europe, the soybean is cultivated in central Europe, in Austria, in 1875, in France the soybean is the object of numerous trials from 1876 to 1881, its cultivation worldwide, the study and acclimatization of soya become generalized.

3. Botanical characters of the soybean: And the varieties of soybeans. 4. Chinese varieties: The soybean in China, the production of soya in China in 1916 and 1917, production of soya in the Far East during the year 1928, exportation of soya from the Far East to Europe.

5. Japanese varieties: The soybean in Japan, varieties of soya from Indochina and from other Asian countries. 6. The soybean in America: American varieties, cultivation of soybeans in Ohio, selection of soya using pure lines in Connecticut.

7. The soybean in Europe: Italy, Russia, France, French climatic zones for the cultivation of *Soja hispida*, the Atlantic zone, the continental zone, the Mediterranean zone and climate, can the soybean be cultivated in all the French climates including those in the north, northeast, and northwest, speedy production of soybeans in view of agricultural production and of the creation of early varieties for the regions in north and northeast France.

8. Instruction for growing soja in France. 9. Soja in Manchuria. 10. Soja seeds. 11. Selection of soja. 12. Varieties of soja. 13. Different ways of planting soya seeds. 14. Soy yield. 15. Nitrogen fixation in soya seeds. 16. Tilling and preparing the earth. 17. Soja fodder. 18. Soja, striking and improving. 19. Harvesting soja grain. 20. Soja oil. 21. Soja oil-cake for animal feeding. 22. Vegetable milk, soja milk and industrial casein.

23. Soja in human food: Soy flour and its applications, soy bread with wheat, nutritional composition of soja compared to dry legumes, soy viewed as a dry legume to replace meat, comparative production of nutritive elements among the various legumes used for human food,

comparative value in calories of the usual foods and of soja, preparation of soy soups and meals in compressed tubes, what varieties of soy can serve the special needs of human nutrition, Sojenta, potatoes stuffed with soy, force meat balls (*boulettes*) of rice and soy, bread of rice and soy, pudding of soy and rice, soy sprouts and their food value, fresh soy sprouts in a salad, soy sprouts with vegetables, soy preserves and confections, soy chocolate, soy coffee, soybeans conserved in containers, soy with smoked fish, soup with soy vegetable meat, soymilk soup, omelet with smoked soy vegetable ham, green soy sprouts, soy cake, soy force-meat fritters.

24. The utilization of soja in the Far East: Vegetable cheese (tofu), soy-based condiments, Japanese natto (2 types), Japanese miso, Chinese miso, soy sauce (*soyou* or *schoziou*), making soy sauce in Kwantung, China, making soy sauce in Japan, koji or molded rice.

25. The culture of soja in North Africa (Rouest has varieties that would grow and yield well in the French colonies of Tunisia, Algeria, and Morocco). 26. Opinions of some authors on soja. Conclusions. Bibliography on soja.

A small photo on the "Dedication" page shows Léon Rouest (born in Paris on 11 Nov. 1872). Address: Directeur de la Station des Recherches Agronomiques d'Avignon.

261. Nakajima, K. 1943. *Nattôkin no ôyô ni kansuru kenkyû* (Jogen oyobi dai 1 pō) [Application of *Bacillus natto* I]. *Nihon Nogeï Kagakkai Shi* (*J. of the Agricultural Chemical Society of Japan*) 19(3):155-62. March (Chem. Abst. 46:7703). [6 ref. Jap]

262. Huebscher, Adolf. 1943. *Die Soja: Ihre Kultur, Verwendung, Zukunft!* [Soya: Its culture, use, and future!]. Grenchen, Switzerland: A. Niederhaeuser. Published by the author. 52 p. Undated. Illust. with 18 line drawings. [Ger] • **Summary:** Contents: Foreword. Soya—The dispenser of work and bread. Botanical description of the soybean. Cultivation and manuring of the fields. Seeds and sowing. Nutritional composition and food value. Harvest, storage and use as silage. Enemies of the soybean. Economic significance of the soybean. Preparation of the soybean for use as food. Soya minestra (an Italian dish, also consumed in Switzerland). Soya beefsteak. Soya cutlets. Tomatoes stuffed with soya. Soy sauces—Japanese shoya [sic, shoyu] and Shimosa. Vegetable cheese [tofu]. Miso-cheese. Natto cheese. Soy coffee. Soy flour (*Soja-Mehle*, made by Morga S.A. or Ennat-Kappel, Switzerland). Soya cakes. Soya salad. Green vegetable soybeans (*Soja-Gruengemuese*). Soya Muesli. Soya Kasha (*Soja-Kascha*, the newest food for soldiers, athletes, and heavy laborers. It consists of a mixture of soy flakes, rolled oats, corn flakes, sugar, salt, and powdered milk). Soymilk (The first soymilk in Europe was made in Paris in 1882). Soy yogurt (*Soja-Yoghurt*). Soy cream for the tropics (*Soja-Crème-Tropenmilch*). Address:

Dr. and veterinarian, villa Bel-Air, Corseaux (Vaud), Switzerland.

263. Barthélemy, M. 1944. Contribution à l'étude du soya en France [Contribution to the study of soya in France]. Clermont-Ferrand, France: Jean de Bussac. 91 p. June 20. Based on his thesis, Strasbourg Univ., Faculty of Pharmacy. [34 ref. Fre]

• **Summary:** This is a published thesis, presented to the Faculty of Pharmacy at Strasbourg. Contents: Introduction. Part I: The cultivation of soybeans. 1. History of cultivation (its origin and importance). 2. Botanical characteristics. 3. Soybean cultivation in detail. 4. Conclusions. Part II: Chemical composition of soybean seeds. Proteins, lipids, oil and lecithin, carbohydrates (*glucides*), minerals, diastases, vitamins, sterols—soyasterol.

Part III: Utilization of soya as a food and in industry.

1. As food (nutritional value, whole soybeans, soy sprouts, roasted soybeans, soy coffee, condiments liquid and solid, soymilk, Li Yu Ying, products derived from soymilk {kefir, yogurt, tofu}, shoyu, miso, natto, soy flour, soy confections, recipes and formulas). 2. In industry: Oil, lecithin, cake. 3. Other uses of the plant.

Part IV: Laboratory work. 1. In human nutrition.

2. Animal feeds for the farm. 3. In industry. General conclusions. Address: Univ. of Strasbourg, France.

264. Nakajima, K.; Ikeda, M. 1944. Nattôkin no ôyô ni kansuru kenkyû. II. Nattô no seizôjôken ni kansuru kenkyû (2). Nattô seizô-ji no ondo oyobi jikan to tanpaku bunkai to no kankei [Manufacture of natto. II. The relation of temperature and time to the decomposition of protein]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 20(6):336-37. June. [1 ref. Jap]

265. Nakajima, K.; Ikeda, M. 1944. Nattô-kin no ôyô ni kansuru kenkyû. III. Nattô no seizô jôken ni kansuru kenkyû (3). Hakkô-chû no ondo henka ni tsuite [Research on the application of natto bacteria. III. Studies on the conditions of natto production (3). Temperature changes during fermentation]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 20(8):425-33. Aug. (Chem. Abst. 46:7703). [3 ref. Jap]

266. Matagrín, Am. 1944. Le soja: Culture et utilisations [Soya: Cultivation and utilization]. Paris: Gauthier-Villars. 72 p. Illust. No index. 28 cm. [Fre]

• **Summary:** Contents: Introduction: Why does soybean culture remain little known in France? 1. What is the soybean (*le Soya*)? Why should it be cultivated?: The plant and its varieties, the soybean (*la fève de soya*) and its general characteristics, alimentary interest in soya, agricultural interest in soya, industrial [non-food] interest in soya.

2. Soybean cultivation: The question of climate, choice

of the variety to cultivate, choice and preparation of the land/soil, fertilizers for soya, soya in crop rotations, seeds, sowing, and seedlings, mixed cultures or intercropping, soybean vegetation and crop management, maturation, harvest, yield, and storage.

3. Use of the soya plant and its seeds: Soya in agriculture and livestock feeding, soya in human foods, recipes, industrial uses of soya, people and organizations connected with soya, contracts for growing soybeans in 1944. Table of contents.

The section on soya in human foods, based on the author's 5-6 years of personal experience, discusses, with recipes: green vegetable soybeans (*soya en légume vert*), whole dry soybeans (*soya en légume sec*), soy sprouts (*germes de soya*), fermented soy condiments (shoyu, miso, natto), soy flour (bread containing soy flour was made at Paris and even at Vichy in 1939), soymilk and tofu (*lait de soya et fromage végétal*), roasted soybeans and a coffee substitute (*soya grillé, substitut de café*), soy oil (*huile de soya*). Address: France; In 1946: Technical Consultant to Bureau Français du Soja.

267. Yamazaki, Momiji. 1945. Tôa hakkô kagaku ronkô [East Asian studies/theses on fermentation chemistry]. Tokyo: Daiichi Shuppan K.K. han. 436 p. Published 20 March 1945. [160\* ref. Jap]

• **Summary:** This remarkable work, published in a limited edition of 1,000 copies, was written by Dr. Yamazaki, a microbiologist, who graduated from the Department of Agricultural Chemistry, Tokyo University, in 1914. The book is a review of existing Asian literature on fermented foods, with a good bibliography. Dr. Yamazaki may have been employed by the laboratories of the Manchurian Railway.

Contents: Introduction: Preface, origin of alcoholic beverages, various alcoholic beverages of the world, summary. Chinese fermentation chemistry documents: Preface, Chinese ancient grains, Chinese ancient grain foods, Various types of Chinese-made koji, Various Chinese-made alcoholic beverages, summary. Japanese fermentation chemistry documents: Preface, Japanese land, inhabitants on Japanese land, Japanese New Stone Age culture, conclusions. Real papers: Japanese ancient foods, Various types of Japanese-made koji, Japanese-made various alcoholic beverages, summary. Korean fermentation chemistry documents: Preface, Korean produced grains, Various types of Korean-made koji, Various Korean-made alcoholic beverages, summary. Tables.

268. Weigle, Edith. 1945. Japanese close-ups. *Chicago Daily Tribune*. Oct. 10. p. R6.

• **Summary:** Tokyo—In the early morning, at about 5:30 or 6:00 (it's still dark in winter), "there comes the song of the boy selling natto [natto]." He calls out the word three times, with two notes to each word. In the key of C, the notes

would be E-G, G-A, E-G. "Nato [sic, Natto], pronounced nah-toe, is a bean [fermented soybeans] used in the morning one-dish meal. When it is mashed, seasoned with raw egg and finely chopped onions, and heated, the Japanese eat it in quantity, washing it down with green tea." They are now ready for the day.

In the early after, the "tofu (bean curd) seller, also rides a bicycle and makes a querulous wailing sound that apparently has the appeal of the Pied Piper, for small children inevitably follow his slow progress down the lanes."

269. Salle, A.J.; Jann, Gregory J. 1945. Subtilin—An antibiotic produced by *Bacillus subtilis*. I. Action on various organisms. *Proceedings of the Society for Experimental Biology and Medicine* 60(1):60-65. Oct. [13 ref]

• **Summary:** *Bacillus subtilis* secretes subtilin, an antibiotic against *Microbacterium tuberculosis*. "In general, Gram-negative organisms [which are often pathogenic] were not appreciably affected by *B. subtilis*."

Table 1 shows "Organisms susceptible to the action of *B. subtilis*." Table 2 shows "Organisms not susceptible to the action of *B. subtilis*." Address: Dep. of Bacteriology, Univ. of California, Los Angeles.

270. Senryôki shuppanbutsu: Ryôri to eiyô. 15 vols. [Publications of the occupation period; Food and nutrition. 15 vols.]. 1946-1951. Japan: 13-26 cm. [Jap]

• **Summary:** Chapter (or volume) 8 of this book is *Nattô no gôriteki seizôhō* (Rational natto production), by Yamazaki Momoji and Miura Jirô.

This is a collection of publications mostly from the censorship collection of Allied Forces for occupation (1945-1952); this group contains works on cooking and nutrition.

271. Inoue, N. 1946. [On the substance of so-called *Bacillus natto* and utilization of the natto]. *Eiyogaku Zasshi (Japanese J. of Nutrition)* 6:88-89. [Jap; eng]\*

272. Taira, T. 1946. [Proteinase of *Bacillus natto* (preliminary report)]. *Oyo Kingaku (J. of Applied Mycology)* 1:84-87. [Jap]\*

273. Chevalier, Auguste. 1947. Cultures nouvelles et cultures qui disparaissent en Afrique Occidentale [New crops and crops which are disappearing in West Africa]. *Revue Internationale de Botanique Appliquée et d'Agriculture Tropicale* 27(293-294):134-38. March/April. [Fre]

• **Summary:** Soya is listed among the new crops. "Soya (Le Soja; *Soja max* Piper = *Glycine soja* Zuccar.) in the indigenous cultures of black Africa in some regions: Upper Côte d'Ivoire, Sudan, South Nigeria, and Cameroon. It is the colonial administrations which have extolled the crop and have distributed the seeds. Thirty years ago the soybean was completely unknown in black Africa, even at the agricultural

experiment stations. The first acclimatizations succeeded poorly. It was necessary to introduce the root nodule bacteria in pure cultures in order to have them sown on lands where soya was cultivated for the first time. Next, it was necessary to investigate the varieties suited to the various tropical climates. The crop was developed in West Africa at the stations of Bingerville at Sérédou (French Guinea), at Dschang (Cameroon), in Nigeria, etc. In Côte d'Ivoire it is only from 1940 that this crop has been propagated and spread among the indigenous people.

"Only 4 varieties have given good results: Haberland [Haberlandt], an old European variety, Bingitt 27 and Bingitt 29, and Mocara black [*Mocara noir*], originally from Java (Roland Portères). These varieties have spread among the indigenous people of the high plateaus of Cameroon, to the south of the Adamawa (l'Adamaoua), and in French Guinea, the region of Macenta and in Upper Côte d'Ivoire, near Bobo-Dioulasso, Banfora, Sikasso, etc. The indigenous people have used them to make fermented pastes to replace the *Soumbara* [also spelled "Soumbala" in later documents], a condiment prepared with the seeds of *Parkia*. However the plant does not seem to be able to contend with peanuts for export. Meanwhile, according to Portères, soya has a certain and promising future in the Mossi [in what is today central Burkina Faso] and in certain mountainous regions of black Africa.

Note 1. This is the earliest reliable document seen (June 2004) concerning soybeans in Côte d'Ivoire, or the cultivation of soybeans in Côte d'Ivoire.

Note 2. This is the earliest document seen (Jan. 2012) that mentions *Soumbara* (also called Soumbala or dawadawa), a condiment made from soybeans instead of the traditional *Parkia* seeds. Address: Professeur honoraire au Museum national d'Histoire naturelle de Paris, France; and publisher of this journal.

274. Horvath, A.A. 1947. Produits fermentés et antibiotiques au soja [Fermented products and antibiotics from the soybean]. *Revue Internationale du Soja* 7(41-42):79. July/Aug. Presented at the First European Soy Congress, 16 March 1947. [Fre]  
Address: Professor, Princeton Univ., Princeton, New Jersey.

275. Osaki, J. 1947. [Antagonism of *Bacillus natto* to pathogens]. *Oyo Kingaku (J. of Applied Mycology)* 2:47-52. [Jap]\*

276. Ozawa, J.; Takeda, A. 1947. [Fermentation of pectin. II. Relation between pectin and processing of food]. *Nogaku Kenkyu (Agricultural Research)* 37:52-53. (Chem. Abst. 44:7460). [Jap]\*

277. Taira, T.; Itami, F. 1947. [Some properties of the proteinase of natto]. *Oyo Kingaku (J. of Applied Mycology)*

2:77-83. [Jap]\*

278. Niida, T.; Yasuda, H. 1948. Estimation of streptomycin with *Bacillus natto*. *J. of Antibiotics* 2(12):827-29. \*

279. Breed, R.S.; Murray, E.G.D.; Hitchens, A.P. eds. 1948. Bergey's manual of determinative bacteriology. 6th ed. Baltimore, Maryland: The Williams & Wilkins Co. xvi + 1529 p. See p. 708-11. 24 cm. Index of names of genera and species.

• **Summary:** The natto bacterium, *Bacillus subtilis*, is part of "Family XIII [p. 704]. Bacillaceae Fisher (\* = Revised by Nathan R. Smith, U.S. Bureau of Plant Industry Station, Beltsville, Maryland (*Bacillus*), Aug. 1943,...)." In this family, Genus 1 (p. 705) is *Bacillus* Cohn (1872) (*Beitrag z. Biol. d. Pflanzen*, 1, Heft 2, 1872, 146 and 175). From Latin *bacillum*, a small stick. A history and description of the genus is given.

There follows (p. 706) a "Key to the species of genus *Bacillus*." The first species is "1. *Bacillus subtilis*." It has these characters: "1. Mesophilic (good growth at 30°C), aerobic (sometimes grow at low concentrations of oxygen).

"A. Spores ellipsoidal to cylindrical, central to terminal, walls thin. Sporangia not distinctly bulged. Gram-positive.

"1. Diameter of rods less than 0.9 micron. Cells from glucose or glycerol nutrient agar stain uniformly.

"a. Growth at pH 6.0. Acetylmethylcarbinol produced.

"b. Gelatin hydrolyzed (Frazier method). Acid from xylose or arabinose with ammoniacal nitrogen.

"c. Starch hydrolyzed. Nitrites produced from nitrates."

Two varieties are also described: "1a. *Bacillus subtilis* var. *aterrimus*. "1b. *Bacillus subtilis* var. *niger*."

Note: No variety *natto* is described.

On pages 708-11 is an article titled *Bacillus subtilis* Cohn, emend., By N.R. Smith. In this long discussion (and in the index), the word "natto" is mentioned only once on p. 710: "*Bacillus natto* Sawamura, *Bull. Coll. Agr.*, Tokyo, 7, 1906, 108." This species is considered "probably identical with or variants of *Bacillus subtilis*."

The first edition of this book appeared in Aug. 1923. The title page of this 6th edition (1948) states that the three main authors were "Assisted by sixty contributors whose names and contributions appear in the pages immediately following." After each contributor is the name or names of the genera to which he has contributed and the page number. The first entry (for example) is: Allen, O.N. *Rhizobium*. 223.

The Introduction begins (p. 1): "No organism can be classified before we have determined, through detailed study, its morphological, cultural, physiological, and pathogenic characters."

An interesting chapter near the front of this book (p. 5) is titled "Historical survey of classification of bacteria, with emphasis on outlines proposed since 1923." The first simple system was developed by Müller in 1773.

This book contains thousands of references; they are located in the description and classification of each genus and species. Address: 1. New York State Experiment Station (Cornell Univ.), Geneva, New York; 2. McGill Univ., Montreal, Province Quebec, Canada; 3. Univ. of Pennsylvania, Philadelphia..

280. Kihara, Y. 1949. Daizu no riyo ni kansuru kenkyu [Utilization of the soybean]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 1. p. 85-98. Jan. (Chem. Abst. 45:6762). [Jap]

• **Summary:** Note: This is the earliest document seen (Oct. 2008) concerning the National Food Research Institute (*Shokuryo Kenkyujo*) in Tokyo, Japan.

Concerning milestones related to access by English-language speakers of this periodical:

First issue with title and author of each article given in English: No. 2 (Aug. 1949).

First issue with summary / abstract of each article given with article in English: No. 5 (March 1951).

First issue with summaries / abstracts of articles given at back of issue in English: No. 6 (March 1952).

First issue with summaries / abstracts only of articles by NFRI researchers published: No. 12 (Aug. 1957).

First issue with reprints of articles by NFRI researchers published: No. 17 (March 1963).

First issue with summary / abstract of each article given at front of article under title and author article in English: No. 21 (Jan. 1966).

Periodical changes title: No. 27 (March 1970).

Periodical moves (with NFRI) from Koto-ku, Tokyo, to Yatabe-machi, Ibaraki-ken, Japan: No. 35 (Oct. 1979). Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

281. Tamiya, H.; Hirano, J.; Fukuda, S. 1949. On the use of natto extract as an effective stimulant for penicillin production. I. *J. of Antibiotics* 2(6):358-63. \*

282. Chatfield, Charlotte. 1949. Food composition tables for international use. *FAO Nutritional Studies* No. 3. 56 p. Oct. [158\* ref]

• **Summary:** A table on page 11 shows "Food composition in terms of retail weight ("as purchased") for soybeans and various soybean products: Whole seeds, dry; Flour, full fat (seed coat removed); Flour, low fat—grits, flakes (partially defatted); Curd, tofu (yield 3.5); Fermented beans—Japanese natto; Fermented beans—Chinese tsiang [chiang]; Soybean milk (yield 7.5); Paste, miso (made with small amounts of rice or other starchy materials) (yield 2.5); Shoyu sauce (yield 3.5). The following are given for each product: Calories per 100 gm, percentage of protein and fat, and yield from 1 kg of soybeans.

Similar but expanded information is given on p. 25,

including carbohydrate, fiber, ash, and refuse. Address: Nutrition Div., FAO, Rome, Italy.

283. Ishidate, Morizo; Shibata, S.; Hagiwara, H. 1949. Nattô-kin no sansei suru kôkin-sei busshitsu ni tsuite (yohô) [Antibacterial substance produced by *B. natto*. (Preliminary report)]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* 69(6-10):373-75. Oct. [9 ref. Jap; eng]

• **Summary:** *Bacillus natto* was cultured in a medium (pH 7.0) which contained glucose, sodium glutamate, and aqueous extract of soy beans. A substance was obtained from the filtrate of this medium which inhibits the growth, in vitro, of *Staphylococcus aureus*—the most common cause of staph infections. “Bacterial, physical and chemical properties of the substance are explained.” Address: Pharmaceutical Lab., the Physiographical Research Inst., and Pharmaceutical Inst., Medical Faculty, Univ. of Tokyo, Tokyo, Japan.

284. Kagawa, Aya. 1949. Japanese cookbook (100 favorite Japanese recipes for Western cooks). Tokyo: Japan Travel Bureau. 162 p. Illust. (line drawings, and color-, and black and white photos). 19 cm. Series: Tourist Library No. 11.

• **Summary:** Contents: Preface. General remarks (The why of Japanese food, its nutritive value, table utensils, an ordinary meal, meals for guests, table etiquette, kitchen utensils, how to cut up fish and vegetables, glossary {incl. aburaage, miso, shoyu, tofu}). Japanese cookery: Table of measures, soups, boiled foods, broiled foods, fried foods, saucepan foods, steamed foods, *hitashimono* (boiled greens in soy [sauce]), aemono (dressed vegetables), vinegared foods, sliced raw fish (sashimi), rice foods, sushi (vinegared rice foods), pickles, seasonal menus, New Year’s foods, Girls’ Festival foods. How to make Japanese cakes (incl. bean paste from red beans).

Many recipes call for “shoyu” [soy sauce]. Soy related recipes: Scrambled egg soup (with shoyu or Worcester sauce, p. 42). Tofu and Japanese leek soup (p. 49). Miso soups (p. 50-51). Broiled egg-plants (with miso, p. 70). Beef sukiyaki (with tofu, p. 79-80). Fish stew (with tofu, p. 81). Odamaki mushi (with yuba, p. 85). Boiled greens in soy (p. 91-92). Dressed food with white sesame [seeds] and vinegar (and aburaage {fried beancurd}, p. 96). Dressed carrot and kidney beans in pod (with tofu, p. 97).

On p. 14 we read: “Soy beans are used very much in Japanese food; especially in hilly regions where fish is scarce, or in vegetarian menus (in connection with Buddhism). Beans are not only simply boiled but eaten in various ways. They are made into tōfu (beancurds), aburaage (fried tōfu), nattō (steamed and fermented beans), shōyu, miso, [azuki] bean-paste used in cakes, etc.” Key flavorings are miso, shoyu, sugar, and vinegar. Sake, mirin, dashi and ajinomoto (seasoning powder) are also important. “Seaweeds are usually eaten dry. Nori (seasoned laver), kombu (tangle), wakame (lobe leafed undaria), hijiki (spindle-shaped

bladder-leaf), and so on, are rich in iodine,...”

“Our special thanks are due to Dr. R.H. [Reginald Horace] Blyth, professor of Gakushin University, who translated the original Japanese manuscript into English.” Aya Kagawa was born in 1899. The book was first published in December 1949 but not copyrighted until 1952. The almost identical 9th printing appeared in April 1955. Only the color photos were changed (upgraded) by 1955. The first true revision and 2nd edition was the so-called “Fourteenth & revised edition” of 1962. Address: M.D. and president of Joshi Eiyô Tanki Daigaku (Women’s Nutrition College), Tokyo, Japan.

285. Ito, Y. 1949. [On the amidase action of *Bacillus natto*]. *Acta Scholae Medicinalis Universitatis Imperialis in Kioto* 27:224-30. \*

286. Ito, Y. 1949. [On the protease action of *Bacillus natto*]. *Acta Scholae Medicinalis Universitatis Imperialis in Kioto* 27:247-61. \*

287. Kanie, M.; Morihara, K. 1949. [On the gelatinase of *Bacillus natto* I]. *Kagoshima Koto Norin Gakko Gakujutsu Hokoku (Bulletin of the Kagoshima Imperial College of Agriculture and Forestry)* 15:101-10. [Jap]\*

288. Mori, M.; Okamoto, K. 1949. [On the antibiotic action of metabolites of *Bacillus natto*]. *Kagaku to Kogyo (Chemistry and Chemical Industry)* 2:228-29. [Jap]\*

289. Yamazaki, Momiji; Miura, Jiro. 1949. Gôriteki nattô no seizô-hô [Rational method of making natto]. In: Gôriteki Nattô no Seizô-hô. Tokyo: Sangyo Hyoronsha Co., Ltd. See p. 89-198. [Jap]\*

• **Summary:** In 1949, Yamazaki and Miura developed a modern fermentation room for natto and created the basis for Japan’s modern natto industry.

290. Nakazawa, Ryoji. ed. 1950-1964. Hakkô oyobi seibutsu kagaku bunken-shû [Bibliography of fermentation and biological chemistry]. Tokyo: Nihon Gakujitsu Shinkokai/ Hirokawa Publishing Co. 11 volumes. In European languages and Romanized Japanese. [500 soy ref. Eng; Jap]

• **Summary:** Contains extensive, excellent bibliographies on the following soy-related subjects (listed here alphabetically): Amazake (p. 139, only 2 references). Kôzi (Koji) (p. 398-410). Mirin (p. 464-65). Miso (p. 465-68). Natto (p. 8-9). Natto bacteria (p. 9-10). Penicillium (p. 210-63; see p. 240 for tempeh and ontjom). Rhizopus (p. 81-97). Soybean and soybean cake (p. 271-77). Syôyu [Shoyu] (p. 436-49). Tôhu (p. 498, only 3 references, all for nonfermented tofu).

Each bibliography lists the documents in approximately chronological sequence. An unnumbered page near the



beginning titled (in Japanese characters only) *Shuyô Inyo Bunken* [Main Periodicals Cited] lists 51 such periodicals, of which 12 are in Japanese. Of these twelve, all have the title written in Chinese characters, with an English translation, and a Chinese plus a romanized abbreviation of the Japanese title.

Two examples: No. 2. *Nippon Nogei Kagaku Kaishi*. J. Agr. Chem. Soc. Japan [J. of the Agricultural Chemical Society of Japan]. *Nô-ka*. No. 4. *Nihon Jozo Kyokai Zasshi*. J. Fermentation Association Soc. Japan. *Zyô-Kyô*. Note that much of the romanization throughout these 11 volumes is based on a system that is no longer used. Nakazawa was born in 1878. Address: Japan.

291. Arimitsu, T. 1950. [Antibacterial effect of *Bacillus natto* and its metabolite for pathogens]. *Hokkaido Igaku Zasshi* (*Hokkaido J. of Medical Science*) 25:1-6. \*

292. Yamada, M.; Muto, H. 1950. [The occurrence of biacetyl as an impurity in fermented alcohol]. *Nippon Jozo Kyokai Zasshi* (*Journal of the Japanese Brewers' Association*) 45:70-71. (Chem. Abst. 46:1705). [Jap]\*

293. Masuno, Minoru. 1950. *Daizu to sono riyô* [The soybean and its utilization]. Tokyo: Sangyo Hyoron-sha. 197 p. [Jap]

• **Summary:** A very nicely done predecessor to Watanabe et al.'s book *Daizu Shokuhin*. Address: Tokyo Daigaku Kyoju, Kôgaku Hakase, Japan.

294. Zakkoku Shorei-kai. 1950. *Daizu no kenkyû* [Soybean research]. Tokyo: Sangyo Tosho. 268 p. [Jap]

• **Summary:** Pages 174-85 discuss: 1. Roasted soybeans (*irimamé*). 2. Cooked whole soybeans and ground soybeans (*nimamé*, *udemamé*, *mamé-zuri*). Soaked soybeans (*hitashi-mamé*). 4. Uncooked ground soaked soybeans (*goto* and *go*). 5. Ground soybean paste molded into shapes (*uchigo*, *gotsu-dotsu*, and *jinda tofu*). 6. A mixture of soybean paste and rice molded into a stick shape (*mamé-shitogi*). 7. Goto miso and Goto miso soup (*Goto misoshiru*). 8. Various kinds of natto. 9. Miso. 10. Miso soup. 11. Roasted soy flour, and soybean flour (*kinako* and *tofun*). 12. [Soy] bean sprouts (*moyashi*). 13. Soybeans soaked in their pods (*mamé-tsuke*).

Note: This is the earliest document seen (Nov. 2008) that mentions *jinda* or *jinda tofu*.

295. Morse, W.J. 1951. What's in a name? *Soybean Digest*. Jan. p. 22-24.

• **Summary:** "Ancient Chinese literature recording the advice of agriculturists on the best varieties of soybeans to plant under different soil and climatic conditions and the utilization of certain varieties for specific purposes, indicates that the soybean was perhaps one of the oldest crops grown by man [sic]. Varieties of soybeans are very numerous

in oriental countries, especially Korea. There during agricultural explorations by the United States Department of Agriculture in 1929 to 1931 more varieties showing a wider range of color, size, and shape of seed and plant characters were found than in China, Manchuria, and Japan.

"The soybean is peculiarly sensitive to changes of soil and climatic conditions and this explains undoubtedly to a very great extent why practically every locality in the soybean regions of eastern Asia has its own varieties. Explorations in small villages in China and Korea revealed that nearly every family had its own favorite varieties for different uses.

"It is noteworthy that of the large number of varieties introduced into the United States from the Orient the same variety has rarely been secured a second time unless from the same locality. Obviously, centuries of experience aided by natural crossing and selection have brought about the development of the vast number of varieties for special purposes under local conditions in China, Korea, and Japan.

"Prior to the introduction of numerous varieties of soybeans by the Department in 1898, not more than eight varieties had been grown in the United States. The culture of these was limited to a few well-defined areas. During the past 50 years the Department has made several thousand introductions of soybeans from China, Korea, Manchuria, Indonesia (Java), and India, representing many hundreds of distinct types.

"This large collection, ranging in maturity from 75 to 200 or more days, has shown wide differences in color, size, shape, composition and quality of seed, plant characters, utilization, and in adaptation to the various soil and climatic conditions in the United States.

"In a recent review of all introductions received from eastern Asia, it was noted that a large number of those from China, Korea, and Japan were sent in under their native varietal names, the translation of which revealed some very interesting and perplexing names. It was interesting to note among the oriental names three—Chief, Chestnut, and Hawkeye—that breeders in the United States have assigned to varieties developed for their own local conditions.

"The many peculiar oriental varietal names of soybeans suggested the title of this article. It was thought that American soybean breeders and growers would be interested in knowing the sort of varietal names soybeans have in other parts of the world.

"It is obvious that the oriental breeder or grower, in naming some of the varieties, must have been in a poetic frame of mind in assigning such names as 'Heaven's Bird,' 'White Spirit of the Wind,' 'Flower Garden,' and 'Clasped Hands.'

"The large number of varietal names is quite understandable as they indicate various seed and plant characters, temples, villages, prefectures, animals, birds, uses, and occasionally a breeder's name. This will be noted

in the following lists and selected classification of varieties.

“It is not to be assumed that these lists of names represent all of the varieties grown in these countries. In fact, they are only a selected number from the varieties introduced into the United States during the past 50 years. It was interesting to note that some of the Chinese varietal names were the same as those in Chinese literature dating back 100 years ago.”

“Selected classification of Chinese soybean varieties:

“Seed Color: Black Belly, Chicken’s Foot Yellow, Crow’s Eye Yellow, Crow’s Skin Green, Flesh Yellow, Musk Deer’s Skin Yellow, Parrot Green, Raven’s Eye Yellow, Tiger Skin.

“Seed Size: Great White, Large Black, Large Green, Large White Eyebrow, Small Golden.

“Seed Shape: Flat Black Golden Round, Large Round Black, Pearl Shape, Round Pearl, Small Round Green.

“Hilum (Seed scar): Flowery Eyebrow, Large White Eyebrow.

“Maturity: August Green, Autumn Azure, Burst Pods in Six Months, Eighth Month White, Filth Month Yellow, Melon Ripe, Midsummer Yellow.

“Pods: Five Month Broad Pod, Four Grain Green, Four Grain Yellow, Iron Pod Green, Three Bean Pod, White Podded Green.

“Leaf: Long Large Green Leaf.

“Pubescence: Hairy Green, Red Hair Green, Sixth Month White Hairy, Yellow Hair Green.

“Utilization: Black Curd, Follow Rice, Round Cattle Feed, Vegetable.

“Odd Names: Entwined Silk, Moon Tooth, Sparrow’s Cackling, Unknown Water.”

“Selected classification of Korean varieties:

“Seed Color: Barbarian Blue, Black Chestnut, Castor Bean Skin, Golden, Indigo, Lacquer Black, Red Striped, Rich Black, Widower (Black and White), Yellow Dragon’s Eye.

“Seed Size: Big Green, Large Black, Small Blackeye, Small Blue.

“Flower: Early White Flower, Large White Flower, White Flower Pure Yellow.

“Hilum: Chotan White Eye, Green Eye, Purple Mouth, Rensen Brown Eye, Small Blackeye, White Eye.

“Maturity: Aid For New Land, Black Sprout, Black Vegetable, Edible, Millet Friend, Plant In Millet, Plant in Wheat, Plant Between Crops, Rainy Season, Roasting, Sprout.

“Habit: Climbing.

“Leaf: Bamboo Leaf.

“Birds: Crow’s Early, Domestic Geese, Pigeon, Skylark, Swallow, Water Rail.

“Animals: Deer, Horse, Mouse, Red Rat, White Horse.

“Village: Anpen, Chotan, Tansen.

“Superior Varieties: Great Happiness, Plentiful, Prolific,

Rich, Rich and Virtuous.

“Odd Names: Beheaded, Clapsed Hands, Cow’s Knee, Flying Fish, Flower Garden, Peaceful, South Sea, Spirit of the Wind, Turtle Nest, White Priest’s Foot, Wild Boar’s Hip.”

“Selected classification of Japanese varieties:

“Seed Color: Black Autumn, Black Saddle, Brown Spotted, Green Fool, India Ink, Mink Skin, Pretty Flesh Color, Silver White, Yellow Jewel, Yellowish White Blackeye.

“Seed Size: Large Green, Large Jewel, Large White, Large White Ring, Small Blackeye, Small Bullet, Small White.

“Seed Shape: Gingko Seed Shape, White Ball, Water Caltrop Shape.

“Hilum (seed scar): Blackeye, Green Eye, No Eye, White Eye, White Mouse Eye.

“Pods: Black Eye Long Pod, Black Pod Gold, Four Seeded Yellow, Fox Pod, One Seed, Red Pod, Three Seeded Pod, Two Seeded Pod, Yellow Pod, White Pod.

“Pubescence: Early Smooth, Green Non Hairy, Half Smooth, Middle Season Smooth, Naked Devil, Non Hairy, Smooth White, Smooth Devil, White Hair.

“Stems: Fan Shape Stem, Red Stalk, Single Stalk, White Stem.

“Leaf: Five Leaf Saddle, Monbetsu Long Leaf.

“Habit of Growth: Akita Bunch, Bunching Maiden, Doesn’t Touch The Earth, Dwarf, Very Bunched Pods.

“Maturity: August, Black Autumn, Early Gold, Middle Season, October, Very Early Abundant, Yellow Fall, Midseason Fox, Through Frost, White Autumn.

“Utilization: Devil Chaser [for roasted soybeans—irime], Forage, Miso, Natto, Paddy Field Boundary, Produces in Shady Places, Soy Sauce, White Sprout.

Superior Varieties: Abundance, Abundant Pods, Brings Treasure, Early Increase, Excessive Yield, Fortune, Heavy Yield, One Hundred Percent Good, Small, Fortune, One Thousand Pod.

“Animals: Early Fox, Mink, Mouse, Small Donkey, Tiger.

“Birds: Crane’s Friend, Dove, Dove Killer, Sparrow, Wild Duck, Wild Goose, Young Crane.

“Persons: Bingo’s White, Chichanari, Hachiya.

“Prefectures (states): Aizu, Chiba, Echigo.

“Shrines: Goshanari, Miyashiro, Zankonji.

“Villages: Chizuka, Hachirihan, Iwakiri.

“Odd. Names: Covered with Frost, Bright Country, Elder Brother, Enter Priesthood, Heaven’s Bird, Old Woman’s Cane, Pretty Girl, Through the Water, Under The Snow, White Dog’s Foot.”

Photos show: (1) Bean curd [tofu] cakes being sold by vendors on streets in Peking, China. In the Orient special varieties of soybeans are used in the manufacture of bean curd and many other soy products. (2) Korean farmers’ market day held weekly in the small villages. This offers

a rich source of soybean varieties. (3) Japanese farm girls planting seed of the Azemame (Paddy Field Boundary Soybean) variety on the land bounding a rice paddy. The beans are used in making miso (salty soy paste), soy sauce, and other foods for human consumption.

Note: This is the earliest English-language document seen (Aug. 2011) that uses the term “salty soy paste” to refer to miso. Address: Retired Principal Agronomist, Div. of Forage Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U.S. Department of Agriculture, USDA.

296. Sakaguchi, Kinichiro; Amaha, Mikio. 1951. Saikin hôshi no tainetsu-sei ni kansuru kenkyû. I. Tainetsu-sei sokute-hô narabini sûshu no inshi no eikyô ni tsuite [Studies on the heat resistance of bacterial spores. I. On the method of determining the heat resistance and the effects of several factors]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 25(2):104-08. Sept. 1. [12 ref. Jap; eng]

• **Summary:** The “basic heat resistance” of spores of the aerobes (i.e., the survival time at 100°C. with spore concentration of 50 million per ml.) are as follows:

*Bacillus natto* 16 minutes. *Bacillus subtilis* 10 minutes. *Sac. mesentericus* 10 minutes. *Bacillus megatherium* 8 minutes. *Bacillus mycoides* 10 minutes. Address: Dep. of Agricultural Chemistry, Faculty of Agriculture, Univ. of Tokyo, Japan.

297. Amaha, Mikio; Sakaguchi, Kinichiro. 1951. Saikin hôshi no tainetsu-sei ni kansuru kenkyû. II. Hôshi nôdo to tainetsu jikan no kankei ni tsuite [Studies on the heat resistance of bacterial spores. II. On the relation between spore concentration and survival time]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 25(3):140-44. Oct. 1. [8 ref. Jap; eng]  
Address: Dep. of Agricultural Chemistry, Faculty of Agriculture, Univ. of Tokyo, Japan.

298. Shinozaki, Yoshiji; Sato, Sadakichi; Kurebayashi, Sumiko. 1951. Nattô-kin ni yoru daizu tanpakushitsu no [The decomposition of soya-bean protein by *Bacillus natto*]. *Igaku to Seibutsugaku (Medicine and Biology)* 21(4):151-54. Nov. 20. [9 ref. Jap]  
Address: Kawasaki Chuô Health Centre, Kawasaki.

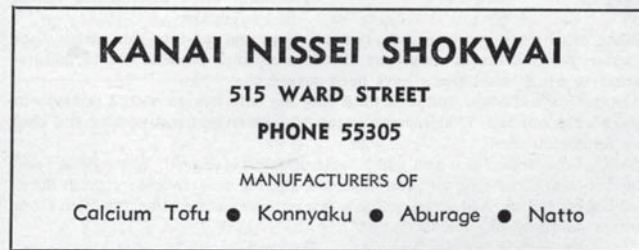
299. **Product Name:** Natto.

**Manufacturer’s Name:** Kanai Nissei Shokai. Later called Kanai Tofu Factory.

**Manufacturer’s Address:** 515 Ward Ave., Honolulu, Oahu, HI 96814. Phone: 581305.

**Date of Introduction:** 1951.

**New Product–Documentation:** Ad by Kanai Nissei Shokwai in Hui Manaolana. 1951. *Japanese Foods: (Tested*



*Recipes*). Honolulu, Hawaii. See p. 62. “515 Ward Street. Phone: 55305. Manufacturers of: Calcium tofu, konnyaku, aburage, natto.” Note 1. This same ad appears on the same page in the 1956 edition of this book.

Note 2. This is the earliest known commercial natto made in the Hawaiian Islands.

Hawaii Directory of Manufacturers: Tofu (bean curd). 1964. Kanai Nissei Shokai, 515 Ward Ave., Honolulu, HI 96814. Phone: 581305. Owners: Mr. and Mrs. Alton Noboyoshi Kanai. Tofu, aburage, konnyaku, natto, kinako. Employees: 11. Wholesale, retail, direct to customer. Hawaii Directory of Manufacturers. 1973. p. 11. Called Kanai Tofu Factory.

300. Burnett, R.S. 1951. Soybean protein food products. In: K.S. Markley, ed. 1951. Soybeans and Soybean Products. Vol. II. New York: Interscience Publishers or John Wiley & Sons. xvi + 1145 p. See p. 949-1002. [125 ref]

• **Summary:** Contents: 1. Soybean flour, grits, and flakes: Introduction, early history, types of soybean flour—standard definitions, amount of soybean flour and related products produced, methods of manufacture, soybean flour in bread, soybean flour in other baked goods, soybean flour in the meat industry, soybean flakes in breakfast foods, soybean flakes and derived peptones as brewing adjuncts, miscellaneous uses of soybean flour. 2. Isolated and modified soybean proteins: Aerating agents for confections and related products, neutral spray-dried soybean protein [isolates], soybean protein in [whipped] toppings, soybean protein and flour in confections, soybean protein and flour in ice cream, soy sauce, monosodium glutamate from soybeans, soybean vegetable milk, tofu, miso, yuba, and other Oriental soybean foods (incl. natto and Hamanatto).

The soy flour industry in the U.S. has grown steadily in recent years. Deliveries of soy flour “from the years 1930 to 1940 averaged about 25 million pounds annually. The deliveries have increased considerably since 1940 partly as a result of an increase in domestic use and partly as a result of deliveries of soybean flour to various government agencies, largely for export. In 1941, Federal purchases amounted to about 10 million pounds of soybean flour. In 1943, the amount increased to 170 million pounds when large shipments were made to Great Britain and the U.S.S.R. under lend-lease. Purchases of soybean flour by the Federal government decreased for several years, but increased in 1946 to an estimated 200 million pounds under the UNRRA

[United Nations Relief and Rehabilitation Administration] program. Total soybean flour deliveries for 1946 were approximately 380 million pounds. In the domestic market the bakery industry was the largest consumer. About 40% of the domestic sales of soybean flour were for bakery use. Since the Bureau of Animal Industry has legalized the use of soybean flour as a binder in meat products, about 20% of domestic sales are to the sausage industry. The balance is used in prepared dough mixes, macaroni, candy, and in institutional feeding.

"In 1947, domestic sales of soybean flour were over 60 million pounds. This amount, plus government purchases and exports, amounted to about 415 million pounds. Two-thirds or more of the present domestic consumption of soybean flour is by the bakery, meat processing, and pet foods industries."

Table 155 (p. 953) shows Bushels of soybeans used for U.S. soy flour production (1942-1947). In 1942-43, the amount of full-fat soy flour produced in the USA was roughly 40% of the amount of defatted. In 1944-45 it was about 49%, but thereafter the percentage dropped rapidly to only 5% in 1946-47.

Note: These statistics relate to Soya Corporation of America, Dr. Armand Burke, and Dr. A.A. Horvath.

Concerning soybean flakes and derived peptones as brewing adjuncts (p. 974-77): "Soybean flakes and grits have been employed by the brewing industry to improve the body and flavor of beer, to increase foam stability, and to stimulate yeast growth.

"Improvement in foam stability and flavor can also be attained by adding directly to the finished beer a hydrolyzed soybean protein which has been broken down to the peptone and proteose stage...

"The early history of the use of soybean products as whipping agents is of interest since this work stimulated the development of processes which eventually led to the production of the present soy albumens. In 1939, Watts and Ulrich pointed out that an active whipping substance could be prepared from solvent-extracted soybean flour in which the protein had not been heat denatured, by leaching it at the isoelectric point of the protein. This extract was found to whip more readily and to a much greater volume than suspensions of the original flour... The active principle in the whipping substance prepared by Watts and Ulrich was probably the nonprotein nitrogenous material present in the soybean flour which is soluble at the isoelectric point of the protein."

Tables show: (155) Soybeans used in the production of low-fat and full-fat flour and grits (1942-1947, 1,000 bushels). (156) Peroxide value of fat extracted from pastries stored at -17.8°C. (0°F.), containing different percentages of soybean flour for periods of 0-6 months. (157) Analysis of uncooked liverwurst emulsion and of processed (water-cooked) sausage containing added soybean flour and water.

(158) Losses in cooking liverwurst containing added soybean flour and water. (159). Analysis of frankfurter emulsion and of smoked sausage made with 3.5% of various binders. (160) Losses in smoking frankfurters made with 3.5% of various binders and after consumer cooking. (161) Effect of the addition of soybean peptone on volume and life of foam on beer. (162) Composition and pH of soybean albumens. (163) Composition of ice creams containing soybean flour. (164) Comparison of soybean milk with cow milk. One sample of cow's milk is compared with 4 samples of soybean milk (probably Oriental) and 3 samples of modern U.S. soybean milk reconstituted (Soyalac for infants, all purpose Soyalac, Soyagen canned from Loma Linda Food Co., California).

Figures show: (199-201, p. 981) Comparison of whipping ability of egg albumen and soybean albumen in different proportions and combinations. (202) Flow sheet for the acid hydrolysis process used in making HVP soy sauce. Address: Protein By-Products Research, Research and Technical Div., Wilson & Co., Inc., Chicago, Illinois.

301. Law, James Thomas. 1951. *Law's grocer's manual*. 4th ed. Edited and revised by W.G. Copey. London: William Clowes and Sons, Ltd. xv + 814 p. See p. 467, 510. Illust. 22 cm. With a foreword by W.R. Austen Hudson, M.P., F.G.I. • **Summary:** Page 467, under the heading "Soy bean," discusses soy sauce, tofu, natto, miso, and soy milk. Page 510 gives more details on tofu and describes (quantly and inaccurately) how to make this "fresh bean cheese." "The beans are soaked in water for 3 or 4 hours, cooked, and reduced to a paste. The milky fluid is strained through a coarse cloth to remove stalk and fibre [okara], and when cooled is precipitated by the addition of crude salt. The precipitate, which is rich in protein and fat, is then kneaded and pressed into cakes called fresh Tofu. They are then dipped into a solution of curcuma." Address: W.G. Copey is Secretary of the Inst. of Certified Grocers; Hudson is President of the National Assoc. of Multiple Grocers.

302. **Product Name:** Natto.

**Manufacturer's Name:** Inose Natto Seizo-sho (Inose Natto Co.).

**Manufacturer's Address:** 1615 W. 135th St., Compton, California. Phone: ME. 4-4718.

**Date of Introduction:** 1952. February.

**New Product-Documentation:** Nichi-Bei Jiji Jushoroku [Japanese American Times Directory]. 1952, p. 380. Under "Compton, Calif." In Japanese: Inose Natto Seizō-sho. In English: Inose Natto Co., 1615 W. 135th St., Compton, California. Phone: ME. 4-4718.

303. Amaha, Mikio. 1952. Saikin hōshi no tainetsu-sei ni kansuru kenkyū. III. Kanetsu-go no baiyō kiso-sei no eikyō. (1) Tokuni tōrui no kōka ni tsuite [Studies on the heat resistance of bacterial spores. III. Effects of sugars in

the subculture media on the survival times of *Bacillus natto* spores]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 26(6):306-13. Oct. 1. [15 ref. Jap]

Address: Dept. of Agricultural Chemistry, Faculty of Agriculture, Univ. of Tokyo, Japan.

304. Amaha, Mikio. 1952. Saikin hôshi no tainetsu-sei ni kansuru kenkyû. IV. Kanetsu ni yoru hôshi no shimetsu genshō ni tsuite [Studies on the heat resistance of bacterial spores. IV. Kinetics of the death reaction of spores by heat]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 26(7):339-45. Nov. 1. [12 ref. Jap]

Address: Dept. of Agricultural Chemistry, Faculty of Agriculture, Univ. of Tokyo, Japan.

305. Amaha, Mikio; Sakaguchi, Kinichiro. 1952. *Bacillus* zoku saikin no hanshoku saibo narabini hôshi no eiyô yôkyû ni tsuite [Nutritional requirements of vegetative cells and spores of aerobic spore-forming bacilli]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 26(7):353-59. Nov. 1. [16 ref. Jap]

• **Summary:** The writers studied the nutritional requirements for formation of vegetative cells and spores of six species of *Bacillus* including *Bacillus natto*. On a completely synthetic medium this species required only biotin for growth, as did *B. mycoides*. Omission of DL isoleucine completely inhibited development of spores. When single amino acids were used for growth (e.g., L-glutamic acid, L-arginine, L-asparagine) they supported fair growth of the vegetative cells and spores.

Note: This is the earliest document seen (Jan. 2012) which states that *Bacillus natto* is different from *Bacillus subtilis* in that the former requires the vitamin biotin for growth, whereas the latter does not. Address: Dept. of Agricultural Chemistry, Faculty of Agriculture, Univ. of Tokyo, Japan.

306. Amaha, Mikio. 1952. Saikin hôshi no tainetsu-sei ni kansuru kenkyû. V. Kanetsu-go no baiyô kiso-sei no eikyô. (2) Bitamin oyobi N gen ni tsuite [Studies on the heat resistance of bacterial spores. V. Effect of vitamins and amino acids in the synthetic subculture media on the survival time of *Bacillus natto* spores]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 26(8):420-27. Dec. 1. [17 ref. Jap]

• **Summary:** The composition of the cultural media was found to influence the survival time of the spores of *Bacillus natto*. The presence of thiamine, pyridoxin [pyridoxine], and biotin were found to be essential vitamins, and their presence prolonged survival time. Amino acids that were converted directly to glutamic acid gave longer survival times.

Note: This is the 2nd earliest document seen (Jan. 2012) which states that *Bacillus natto* is different from *Bacillus subtilis* in that the former requires the vitamin biotin for

growth, whereas the latter does not. Address: Dept. of Agricultural Chemistry, Faculty of Agriculture, Univ. of Tokyo, Japan.

307. Kanie, M.; Morihara, K. 1952. [On the gelatinase of *Bacillus natto* II. Characters of gelatinase]. *Kagoshima Daigaku Nogakubu Gakajutsu Hokoku (Bulletin of the Faculty of Agriculture, Kagoshima University)* 1:80-84. [Jap]\*

308. Kanie, M.; Morihara, K.; Kisanuki, M. 1952. [On the gelatinase of *Bacillus natto* III. Dissimilarity of production of the gelatinase components]. *Kagoshima Daigaku Nogakubu Gakajutsu Hokoku (Bulletin of the Faculty of Agriculture, Kagoshima University)* 1:85-89. [Jap]\*

309. Masao, H. 1952. [Studies on natto and natto bacilli. I. Bacteriological studies]. *J. of the Nihon Medical University* 19:240-43. \*

310. Hayashi, Uichi. 1952. Nattô seizô-ji ni okeru N busshitu no henka ni tsuite [The change of N-compounds during natto manufacturing]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 4(5):188-91. (Chem. Abst. 5395. 1954). [Jap]

311. Petelot, Alfred. 1952. Les plantes médicinales du Cambodge, du Laos et du Vietnam [The medicinal plants of Cambodia, Laos, and Vietnam. Vol. 1]. *Archives des Recherches Agronomiques au Cambodge, au Laos et au Vietnam* No. 14. 408 p. See p. 276-81. [20 ref. Fre]

• **Summary:** The section on the soybean (*Soja hispida* Moench, p. 276-81) includes the vernacular names: Vietnamese: *Dau nanh, Dau tuong, Dau hon, Dau xa*. Cambodian: *Sandek sieng*. Laotian: *Mak toua kon, Ta ton*.

Discusses: Whole dry soybeans, green vegetable soybeans (*Elles peuvent... être consommées à l'état jeune à la façon des flageolets,...*), soymilk (*elles donnent une sorte de lait moussieux et crémeux,...*), nutritional composition, tofu (*le graines sont utilisées pour la préparation d'un fromage, le Teau-fou des Chinois, le dau-phu des Vietnamiens*), composition of fresh and moisture-free tofu, soy oil and its properties (In Europe, above all in England, this oil is used to make soap and margarine. Its drying properties enable it to be used to make paint), soybean cake (used as animal feed; it is rich in lysine), lecithin, vitamin B, the Agronomic Institute of Ankara, Turkey, has found soya to be superior as an animal feed to all other legumes cultivated in Turkey, defatted soybean meal, useful in diabetic diets, Haberlandt of Vienna suggests use as human food, fermented soy products and rice koji, natto, miso, shoyu, *Tsao Yu* of China, *tuong dau* of Vietnam, Japanese natto, MSG. Address: Chargé de Cours à la Faculté Mixte de Médecine et de Pharmacie de Saïgon [Vietnam].

312. Inoue, Norimasa. 1953. Nattô no kyôka ni kansuru kenkyû. I. Nattô no kyôka hôhō ni tsuite [Studies on the enrichment of natto (fermented soybeans). I. On the method of enrichment of natto]. *Eiyogaku Zasshi (Japanese J. of Nutrition)* 10(6):179-81. April. [1 ref. Jap; eng]  
 • **Summary:** The main nutrient added is vitamin B-2.  
 Address: Kokuritsu Eiyō Kenkyusho (National Inst. of Nutrition, Japan).
313. Nakano, M.; Ohta, H. 1953. Nattô ni kansuru kenkyû. I. Nattô-kin no hatsu netsu ni tsuite [Research on natto. I. On the production of heat by the natto bacillus]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 8. p. 187-92. June. English-language summary p. 18. [1 ref. Jap; eng]  
 Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.
314. Nakano, M.; Ohta, H. 1953. Nattô ni kansuru kenkyû. II. Eiyô kyôka nattô ni tsuite [Research on the natto bacillus. II. The manufacture of enriched natto]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 8. p. 193-95. June. English-language summary p. 19. [1 ref. Jap; eng]  
 Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.
315. Sakai, Heiichi. 1953. Bisei-butsu ni yoru bitamin B-12 no seisan ni tsuite. II. Kaku shu bisei-butsu no B-12 seisan shiken [On vitamin B-12 production by fermentation. II. Production test of B-12 by various microorganisms]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 27(7):405-07. July. [7 ref. Jap; eng]  
 • **Summary:** Two strains of *Bacillus natto* produced 33.0 and 50.0 nanograms respectively of vitamin B-12 (LLD active substance) per cc in shaking culture. This was the highest value of 15 yeasts, 25 fungi (molds), and 25 bacteria tested. Four species of actinomycetes yielded higher values (80-100 nanograms per cc). Address: Tokyo Daigaku Nôgaku-bu, Hakkogaku Kyoshitsu (Fermentation Lab., Agricultural Faculty, Tokyo Univ., Japan).
316. Miyake, Suguru; Shimizu, Junichi. 1953. Nattô-kin tanpakushitsu bunkai kôso ni kansuru kenkyû. I. Tanpakushitsu bunkai kôso no kesshō ni tsuite [The studies on *Bacillus natto* protease. I. On crystallization of protease]. *Hyogo Noka Daigaku Kenkyu Hokoku, Nogaku-hen (Science Reports of the Hyogo University of Agriculture)* 1(1):11-14. (Chem. Abst. 49:12601). [6 ref. Jap; eng]  
 Address: Lab. of Biological Chemistry, Hyogo Univ. of Agriculture.
317. Miyake, Suguru; Nonoguchi, Yoshitaka. 1953. Nattô-kin tanpakushitsu bunkai kôso ni kansuru kenkyû. II. Tanpakushitsu bunkai kôso no kesshō-kei no henka ni tsuite [The studies on *Bacillus natto* protease. II. On the change of crystal form of *Bacillus natto* protease]. *Hyogo Noka Daigaku Kenkyu Hokoku, Nogaku-hen (Science Reports of the Hyogo University of Agriculture)* 1(2):45-46. Dec. (Chem. Abst. 49:12601). [Jap; eng]  
 Address: Lab. of Biological Chemistry.
318. Fujii, M. 1953. [Studies on Japanese foods. Report II. On the digestibility and absorption rate of legumes]. *Fukuoka Igaku Zasshi (Fukuoka Acta Medica)* 44:374-81. [Jap]\*
319. Kakimoto, D.; Kanazawa, A. 1953. Study on the transamination in *Bacillus natto*. No. 8. (I), (II). *Memoirs of the Faculty Fisheries, Kagoshima University* 3:121-31. \*
320. Masao, H. 1953. [Studies on natto and nattobacillus. II. Immunological studies]. *J. of the Nihon Medical University* 20:449-52. \*
321. Chatfield, Charlotte. 1954. Food composition tables: Mineral and vitamins, for international use. *FAO Nutritional Studies* No. 11. 117 p. March. [539\* ref]  
 • **Summary:** Table 1 gives "Food composition in terms of the retail weight, ("As purchased"). The section on "Pulses, nuts and seeds" (p. 13-14) includes values for: Groundnuts, peanuts. Soybeans (*Glycine max*) and soybean products—Whole seeds, dry. Flour, full fat (seed coat removed). Flour, low fat; grits, flakes (partially defatted). Curd, tofu. Fermented beans, Japanese natto. Fermented beans, Chinese tsiang [jiang]. Soybean milk. Paste, miso (made with small amounts of rice and other starchy materials). Shoyu sauce. Sprouts: See No. 86a.  
 Also: Broad beans. Common beans. Hyacinth, lablab, and twinflower beans. Jack beans and sword beans. Lima beans. Mung beans and urd beans. Voandzeia (without shell). Chickpeas. Cowpeas. Lentils. Peas. Pigeonpeas (*Cajanus* spp.).  
 Table 2 gives "Composition of the edible portion (E.P.) and refuse in the material as purchased (A.P.)." The section on "Pulses, nuts and seeds" (p. 31-33) gives values for the same foods listed in Table 2.  
 These tables contain corrections to the Food Composition Tables of Oct. 1949. On pages 52+ is an index to the scientific names of plants in the tables. Address: Nutrition Div., FAO, Rome, Italy.
322. *Hartford Courant (Connecticut)*. 1954. Street hawker remains familiar figure in Tokyo. Oct. 24. p. D14.  
 • **Summary:** No longer seen in the USA, street hawkers do a brisk business in Tokyo. The sellers of each product have their unique call. "The juvenile vendor is likely to be repeating 'Natto,' 'Natto' in young and earnest tones. He is

selling fermented beans, which are served with soya sauce over warm cooked rice.”

“‘To-fu ya-san’ appears with bean curds” [tofu].

The ‘chin-don-ya-san’ is a one man band and children’s theater. The ragman, and the peddlers of shell-fish and bamboo poles can also be heard.

323. Yoshida, O.; Nakajima, Y.; Fujii, H.; Takahashi, S. 1954. [On the production of vitamin B-2 by *Bacillus natto*]. *Osaka Ika Daigaku Zasshi (J. of Osaka Medical College)* 15:3-6. [Jap]\*

324. Katsumata, Senkichiro. ed. 1954. Kenkyusha’s new Japanese-English dictionary. Entirely new ed. Tokyo: Kenkyusha. xvi + 2136 p. 24 cm.

• **Summary:** Soy related words:

aburaage: see aburage.

aburage: fried beancurd.

atsuage: not listed.

age: a piece of fried bean-curd.

ama-miso: slightly salted bean paste. daizu: A soya (= soy) bean. daizu kasu: a [soy] bean cake [a co-product of soy bean oil]. daizu abura: [soy] bean oil.

dengaku: bean curd baked and daubed with miso.

dengaku-zashi ni sareru: to be transfixed; to be pierced through (as with a spear).

edamame: green soybeans.

ganmo: not listed.

ganmodoki: not listed.

inarizushi: fried bean-curd stuffed with boiled rice.

kôji: malt (mugi); yeast; leaven (kôbo); kôji-ya: a maltster [a maker of kôji]. kôji ni suru: to malt something.

kuromame: a black soy bean.

miso (chomiryô = seasoning): bean paste; miso. miso o suru: to mash the miso [as in a suribachi]. miso kakeru: to put miso on something (as food). (2) (tokui to ten) sore ga kare no miso da: that is what he takes pride in [that is what he is good at]. (3) (hikakuteki-ni) miso o kakeru (shuppai suru): to make a mess (=sad work) of something; to make a miserable (=poor) showing. miso o suru (hetsurau): to flatter [someone, as one’s superiors]. [Modern is goma suru; kare, shatcho ni goma shitte-iru: he is flattering his boss. A grinding gesture goes with it. goma-suri: a person who flatters]. kuso miso ni iu: to speak meanly of a person; to speak of a person in the most disparaging terms. miso mo kuso mo isshoni suru: to mix up good and bad things. miso no miso kusaki wa, jô miso ni arazu: The secret of art lies in concealing art [Akiko never heard this saying]. soko ga miso darô: perhaps that’s the point he takes pride in [=the key point].

nama-age: fried bean curd.

natto: fermented soybeans. natto uri: a vendor of fermented soybeans. natto-jiru: miso soup with ground fermented soybeans.

oboro: not listed.

okabe: = tofu.

okara: bean curd refuse.

shôyu: soy.

tôfu: beans curds (=cheese); tofu. tofu itcho: a piece (=cake) of bean-curd. tofu-ya: a bean-curd dealer (=seller). yaki-dofu: roasted bean-curd. kare ni iken shita totte, tôfu ni kasugai da: advice to him is like water sliding off a duck’s back = It’s a mere waste of words (=It is like pouring water into a sieve) to advise him.

yuba: dried bean curds [sic, dried soymilk]. tofu-ya e ni ri, saka-ya e san ri to iu tokoro da: there is no human habitation within five miles of the place. [It’s out in the boondocks].

Food words that are not related to soy: akameshi: see sekihan.

amazake: a sweet drink made from fermented rice.

an: bean jam. an no haitte iru: stuffed with bean jam. an o ireru: to stuff with bean jam. an ni kurumu: to cover with bean-jam.

anko: bean-jam = an.

azuki: a red bean; an India bean. azuki meshi [azuki gohan]: rice boiled with red beans. azuki-iro: reddish brown, russet.

azuki-aisu: iced bean-jam.

azuki-gayu: red-bean gruel.

beni-shôga: red pickled ginger.

kaiseki: a light [vegetarian] meal served before (a) ceremonial tea.

kaisô: seaweeds, marine plants; algae; seaware (hiryô-yo). kaiso-hai: ash from kelp. kaiso-fun: kelp meal [for food].

konbu: (sea) tangle; kelp; a devil’s apron. *Laminaria*. kizami konbu: sliced tangle. konbu-maki: a tangle roll. tororo konbu: scraped tangle. konbu-cha: a sea-weed drink [tea].

mochi: rice-cake. mochi o tsuku: to pound steamed [glutinous] rice into cake. mochi wa mochi-ya: Every man has his forte = A specialist has his own strength (= strong point). = Every man to his trade.

nankin-mame: a groundnut. (American) a peanut; a monkey nut.

nori: laver, sloke. hoshi (ajitsuke) nori: dried (seasoned) nori. ao (Asakusa) nori: green (Asakusa) nori. nori no tsukudani: laver boiled down in soy.

sekihan: rice boiled together with red beans [okowa].

shiruko: red bean soup with rice cake. shiruko-ya: a *shiruko* store; a bean-soup house.

wakame: *wakame* seaweed. *Undaria pinnatifida*.

zôni: rice cakes boiled with vegetables. zôni o iwau [to celebrate]: take the New Year’s breakfast of rice cakes boiled with vegetables.

Words or terms not mentioned: Hamanatto. Daitokuji natto. Address: General editor, Japan.

325. Umeda, Shigeo. 1954. Nattô no tsukurikata [How to make natto]. Osaka City, Japan: Fuminsha. 4 + 3 + 114 p. Illust. 19 cm. Series: Fumin Nogyo Sensho, no. 29. [Jap]\*  
 • **Summary:** Shigeo Umeda lived 1903-1965. Address: Japan.

326. Takahashi, Jusaku. 1955. 2, 3 no bitamin B-12 no shigen ni tsuite. I. [Studies on several sources of vitamin B-12. I.]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 8(2):25-27. March 11. [Jap]  
 • **Summary:** A significant amount of vitamin B-12 is found in natto and miso, although little is found in the whole soybeans from which these products are made. The amount of B-12 in soybeans and various soyfoods is as follows (measured in nanograms per 100 gm): Fresh whole dry soybeans 8, Tengu natto (sold commercially) 83, Shinshu miso 170, Shinshu miso (boiled for 15 minutes) 170, Shinshu miso (boiled for 30 minutes) 162.

When natto is stored at 30°C, vitamin B-12 is slowly lost. It drops from 83 nanograms per 100 gm when fresh to 49 nanograms per 100 gm after 3 days.

327. Sawada, T.; et al. 1955. Biseibutsu no kobaruto taisha ni kansuru kenkyu. II. *Aspergillus oryzae* oyobi *Bacillus natto* no kobaruto kyûshû ni tsuite [Studies on cobalt metabolism of microorganisms. II. On absorption of *Aspergillus oryzae* and *Bacillus natto*]. *Nippon Kagaku Kaishi (J. of the Chemical Society of Japan)* 76(3):274-77. March. [7 ref. Jap]

328. Morohashi, Tetsuji. 1955-1960. Daikanwa jiten [Chinese-Japanese historical dictionary]. Tokyo: Taishukan Shoten. 12 vols. + index (alphabetic by phonetic Japanese pronunciation). Cites earliest references (usually in Chinese documents) for Japanese words. [25+ ref. Jap]  
 • **Summary:** This is widely regarded as one of the greatest Chinese dictionaries. Volume 11, pages 394-95. The following pronunciations of Chinese words may not be correct. (33) Sho. Hishiomiso. Incubate rice or barley or beans, etc. Let them ferment and add salt to make these. (35) Chiang Yuan. Miso and shoyu shop. The shop where miso, shoyu, and pickles are sold. (36) Shoko. A big earthenware pot in which hishio is kept. (37) Shokyû. Shishibishio in a hot soup. (39) Chiang tsai. Miso pickled vegetables. (40) Shosho. Miso and shoyu craftsmen. (41) Shosui. Soup or porridge (Zosui) cooked with miso. Ruiju Meibutsuko, Shakuso orai. (42) Shosei. Hishio with flavor. (43) Shotsui. Hishio pot. (45) Chiang fang. Miso and/or shoyu shop. See (35). (46) Shobutsu Hishio. (47) Hishio no kame. Hishio vat. (48) Chiang-yu. Chinese soy sauce. Cooked soybeans, roasted barley and salt are fermented. The liquid is extracted; a salty seasoning, also called shitaji or murasaki.

329. Chung, T.S. 1955. [Enzymological studies on the fermented soybean products. I. On the protease activity of

natto]. *Bulletin of the Scientific Research Institute (Seoul, Korea)* 1:19-23. [Kor]\*

• **Summary:** Optimal pH and temperature for natto protease was found to be 7.0 to 8.0 and 45°C respectively. Address: Section of Food and Nutrition, The Scientific Research Institute M.N.D. Korea, Seoul, Korea.

330. Chung, T.S. 1955. [Enzymological studies on the fermented soybean products. II. Differential inactivation of alpha-amylase and beta-amylase in natto and malt]. *Bulletin of the Scientific Research Institute (Seoul, Korea)* 1:24-30. [Kor]\*

Address: Section of Food and Nutrition, The Scientific Research Institute M.N.D. Korea, Seoul, Korea.

331. Miyake, S.; Watanabe, K. 1955. [The studies on *Bacillus natto* protease. III. Relation between deamination and protease production]. *Seikagaku (Biochemistry)* 27:209-11. [Jap]\*

332. Takahashi, Jusaku. 1955. 2, 3 no bitamin B-12 shigen ni tsuite. I. [Studies on some sources of vitamin B-12. I.]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 8(2):49-51. (Chem. Abst. 54:18813. 1960). [Jap]

• **Summary:** Table 4 shows the vitamin B-12 content for the following soyfoods: Raw whole soybeans 8. Tengu natto 83. Shinshu miso 170. Misozuke ayu (ayu {sweetfish; *Plecoglossus altivelis*} fish pickled in miso) 2538.

Note: The units of B-12 per 100 gm are unclear.

333. Kida, Setsuko; Hashida, Wataru; Teramoto, Shiro. 1956. Nattô oyobi nattô-kin ni kansuru gakuteki kenkyu. I. [Nutritional studies on natto and *Bacillus natto*. I. On the nutritional requirements of natto-bacillus]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 34(11):542-46. Nov. [16 ref. Jap; eng]

• **Summary:** Six strains of natto bacillus used in this study were isolated from several samples of natto in the market. These strains very much resembled the typical natto bacteria (*Bacillus natto* Sawamura etc.) and were also related to *Bacillus subtilis* NRRL 558 and to *Bacillus mesentericus*. According to the classification in *Bergey's Manual of Determinative Bacteriology* (6th ed.) the strains studied here may be included in the group *Bacillus subtilis*.

The nutritional requirements of the natto bacillus and *Bacillus subtilis* were compared when growing on a synthetic medium. The strains isolated from natto differed from *B. subtilis* NRRL 558 in that they required biotin in the vitamin-omission test and could not utilize certain amino acids (DL-serine, DL threonine, DL methionine) as a sole nitrogen source.

Note: This is the 3rd earliest (but the clearest) document seen (Jan. 2012) which states that *Bacillus natto* is different from *Bacillus subtilis* in that the former requires the vitamin



biotin for growth, whereas the latter does not. Address: Dep. of Fermentation Technology, Faculty of Engineering, Osaka Univ., Japan.

334. *Chicago Daily Tribune*. 1956. Musical sounds abound when you're in Japan. Dec. 9. p. F18.

• **Summary:** In the early morning “the natto seller peddles his fermented beans with a musical call of ‘Natto, Natto.’”

Another food vendor “sells tofu (soybean curd). He does his advertising with a horn and his call of ‘tofu!’”

335. Kohono, C. 1956. [Studies on the protein digestion of natto (I)]. *Mukogawa Gakuin Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.—Domestic Science Series)* 4:131-36. [Jap]\*

• **Summary:** 2008 Aug. 12. WRS e-mailed www.nodai.ac.jp/english/... = Tokyo University of Agriculture.

The one I've been to is University Library for Agricultural and Life Sciences at 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657.

336. Miyake, S.; Watanabe, K.; Yoshikawa, M.; Nonoguchi, Y. 1956. [The studies on *Bacillus natto* protease. IV. The effect of urea on the enzyme activities of *Bacillus natto* protease]. *Seikagaku (Biochemistry)* 28:527-29. [Jap]\*

337. Toya, N. 1956. [Chemical studies on the process of natto manufacturing]. *Kumamoto Joshi Daigaku Gakujutsu Kiyo (J. of Kumamoto Women's University)* 8:114-23. [Jap]\*

338. Miyake, Suguru; Watanabe, Ken; Yoshikawa, Mitsuyoshi; Nonoguchi, Yoshitaka. 1956. Nattô-kin tanpakushitsu benkai kôso ni kansuru kenkyû. V. Kesshô protease no kôsei aminosan ni tsuite [The studies on *Bacillus natto* protease. V. The constituting amino acids of the crystalline protease of *Bacillus natto* Sawamura]. *Hyogo Noka Daigaku Kenkyu Hokoku, Nogaku-hen (Science Reports of the Hyogo University of Agriculture)* 2(2):116-17. (Chem. Abst. 51:10609). [3 ref. Jap; eng]  
Address: Biochemical Lab.

339. Fukumoto, J.; Yamamoto, T.; Ichikawa, K. 1957. [Studies on bacterial proteinase. VII. Some enzymatic properties of proteinase secreted by several strains of *Bacillus subtilis*]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 31(5):331-338. May. [24 ref. Jap]  
Address: Inst. of Polytechnics, Osaka City Univ.

340. Satomura, Yukio; Okada, Shigetaka; Fukumoto, Juitiro [Juichiro]. 1957. [Studies on bacteriolytic substances produced by microorganisms. I. Lysozyme-like enzyme accumulated in a culture filtrate of a *Bacillus subtilis* sp.]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical*

*Society of Japan)* 31(5):281-284. May. [22 ref. Jap]  
Address: Inst. of Polytechnics, Osaka City Univ.

341. Satomura, Yukio; Okada, Shigetaka; Fukumoto, Juitiro. 1957. [Studies on bacteriolytic substances produced by microorganisms. II. Cultural conditions for accumulation of lysozyme-like enzyme produced by a *B. subtilis* sp.]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 31(5):285-288. May. [4 ref. Jap]  
Address: Inst. of Polytechnics, Osaka City Univ.

342. Satomura, Yukio; Okada, Shigetaka; Fukumoto, Juitiro. 1957. [Studies on bacteriolytic substances produced by microorganisms. III. Relation between formation of lysozyme-like enzyme and lysogenicity, bacteriocinogenicity and anaerobic-lysis of a *B. subtilis* sp.]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 31(5):289-293. May. [6 ref. Jap]  
Address: Inst. of Polytechnics, Osaka City Univ.

343. Hayashi, Shizuka. 1957. Soybean “schools” in larger cities. *Soybean Digest*. Feb. p. 25.

• **Summary:** “The Japanese-American Soybean Inst. is the operating agency for the market development project in Japan that is being conducted by the American Soybean Association and utilizing P.L. 480 funds.”

The Institute has arranged for the production of a movie film about 18,000 to 20,000 feet in length showing the production and consumption of soybeans, with emphasis on the fact that they are the least expensive source of nutrition. Note: This film, titled “The Green Bud,” was released by Dec. 1957.

Arrangements have been made with the Food Life Improvement Association (a government agency under the Ministry of Agriculture) and the Japan Nutrition Organization (a government agency under the Ministry of Welfare) for the opening of classes in various cities throughout Japan. More than 800 public health centers are engaged in activities first to educate prefectural leaders as to the value of soybeans and how to use more effectively the various soybean products in daily life, and then gradually to expand such activities throughout the whole population.

Researchers at Kyoto University will investigate why U.S. soybeans are not suitable for making natto and kinako. A study will also be made to find a method to preserve natto in a dried condition.

“Japan purchased approximately 300,000 metric tons of new crop [soy] beans during October-December 1956 and the first half of January 1957. This included 34,040 metric tons from China. The total budget for October 1956 to March 1957 calls for a total of 435,000 tons including 10,000 tons from Brazil.” A photo shows Mr. Shizuka Hayashi. Address: Managing Director, Japanese-American Soybean Inst., Tokyo.

344. Hayashi, Shizuka. 1957. Manufacture of natto is described. *Soybean Digest*. March. p. 30-31.

• **Summary:** Contents: Introduction. Screening selection (cleaning by removing foreign substances). Washing. Water soaking. Steam cooking. Implanting natto bacillus (*Bacillus natto*). Packing (into *kyogi*—thin, slice-cut veneers of wood; 0.331 lb of inoculated beans becomes 0.273 lb of natto). Placing in curing room (9 feet wide, 7 feet tall, and 9 feet from front to back. Heated by charcoal and kept at 42-43°C). Removal from curing room. Value of natto. A flow diagram shows the main steps in the process. The chemical composition of natto is given. “It is reported that natto bacillus suppresses the multiplication of various disease-causing bacteria within the digestive organs.” Natto keeps (without refrigeration) for 2-3 days in summer, 7-10 days in winter. Address: Managing Director, Japanese-American Soybean Inst., Tokyo, Japan.

345. Chung, T.S.; Kim, C.J.; Hwang, K.S. 1957. [Enzymological studies of the fermented soybean products. IV. Amino acid composition of natto proteins]. Seoul, Korea. [Kor]\*

• **Summary:** Mimeographed. Address: The Scientific Research Institute M.N.D. Korea, Seoul, Korea.

346. Kohono, C. 1957. [Studies on the protein digestion of natto (III)]. *Mukogawa Gakuin Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.—Domestic Science Series) 5:281-87*. [Jap]\*

• **Summary:** 2008 Aug. 12. WRS e-mailed [www.nodai.ac.jp/english/](http://www.nodai.ac.jp/english/)... = Tokyo University of Agriculture.

The one I've been to is University Library for Agricultural and Life Sciences at 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657.

347. Kohono, C. 1957. Studies on the protein digestion of natto (II). *Mukogawa Gakuin Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.—Domestic Science Series) 5:133-39*. [Jap]\*

• **Summary:** 2008 Aug. 12. WRS e-mailed [www.nodai.ac.jp/english/](http://www.nodai.ac.jp/english/)... = Tokyo University of Agriculture.

The one I've been to is University Library for Agricultural and Life Sciences at 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657.

348. Miyamoto, Kazuo. 1957. A nisei discovers Japan. Tokyo: Japan Times. [x] + 282 + [4] p. See p. 181. Illust. Port. No index. 20 cm.

• **Summary:** The author, a physician and American citizen, lived with his wife and two children for two years in Japan between 1937 and 1939 “just after the beginning of the China Incident.” He spoke and wrote Japanese fluently.

Page 7: On 29 Sept. 1937, after just arriving in Japan,

they enter Tokyo. He notes that prices are high, protein consumption is therefore insufficient, and the general population seems undernourished. Beans, including soya beans, ought to be used more extensively. Except for misoshiru [miso soup] and natto, they are apparently not widely used. He suggests that the government welfare department develop and publish soy recipes for the health of the people.

Page 48: On 8 Feb. 1938 on a trip into Yusawa, Niigata, in northeastern Japan, he went skiing. For lunch at a inn he had “natto with lots of onions to erase the odor.”

On a train from Ueno station, Tokyo, he has breakfast in the diner of miso-shiru [miso soup], tsukemono [pickled vegetables], and rice for 25 *sen*.

Page 129: In Aomori at the hotel for breakfast they enjoy delicious eggplant fried in butter with shoyu, pepper, and pieces of chiso [beefsteak leaves].

Page 171: At Aoyama hot springs in Hokkaido, caught in a blizzard, he has a bento [Japanese box lunch] from the hotel that includes miso-shiru.

Page 181: On 21 March 1938 they are at the port of Shimonoseki, Japan (in southwestern Honshu, just north of Kyushu, in Yamaguchi prefecture, facing the Tsushima Strait). He notes that many people pass through this port on their way to Chosen [Korea] and Manchukuo [Manchuria].

Shimonoseki is known for its *fugu* or balloonfish (also called globefish or swellfish) for it is here that the largest catch in Japan is taken each year.

They found an eating place, Fujitomo, that served the delicacy. The raw sliced meat was arranged on a huge platter in three rows of semi-circles, so thinly sliced that it was transparent. “The above were dipped in a sauce prepared with murasaki, lime and onions. Tai, considered the king of fishes, must be allotted second place to this delicacy...”

Note 1. The word “murasaki” means purple in Japanese, and is still used in sushi shops and other specialty eating places to refer to soy sauce.

Note 2: This is the earliest English-language document seen (March 2008) that uses the word “murasaki” to refer to soy sauce.

The balloonfish is so poisonous it can kill a person; the toxin is contained in its ovaries. “At Shimonoseki, the season comes to an end at the end of March for then the spawning season begins and the danger of poisoning becomes greater.”

Page 201: On a trip to Korea he enjoys *manul zany*, garlic pickled in shoyu.

In April 1955, the family returned to Japan to visit new relatives. Near Furukawa, in northeastern Japan, they inspected a “miso and shoyu factory.”

Also discusses: Nori (p. 128). Wakame (seaweed, near Idzu / Izu) (p. 276). Address: Honolulu, Hawaii.

349. Black, H. 1958. Die Sojabohne—Ein Hauptnahrungsmittel der Zukunft [The soybean—A major

food for the future]. *Ernaehrungs-Umschau* 5(2):33-34. March/April. [Ger]  
Address: Bonn, West Germany.

350. Smith, Allan K. 1958. Use of United States soybeans in Japan. *USDA Agricultural Research Service*. ARS-71-12. iii + 36 p. April. April. Illust. 28 cm. Typewritten.

• **Summary:** An extremely well researched, interesting document based on a survey conducted in 1957 in Japan. Contents: Definitions of Japanese food products. Introduction. 1. Problems of Japanese food processors in using U.S. soybeans: Food production problems, foreign material, broken and dark-colored soybeans in exports. 2. Analysis of the problems. 3. Research proposals. 4. Miso: Processing, uses, production, composition. 5. Tofu and its modifications: Processing fresh tofu and frozen tofu, aburage. 6. Natto. 7. Hamanatto. 8. Kinako. 9. New products research: Soybean "milk," fermented cheese, soybean flour and isolated protein for foods, isolated soybean protein. Acknowledgments.

A graph on the front cover (and on p. 6) shows soybean production in the USA from 1938 to 1957 (in millions of acres harvested). Photos show: (1) Drying soybeans before threshing in Japan. (2) Manually operated threshing machine. (3) Power operated threshing machine. (4) Modern small-scale equipment for cleaning soybeans and grading for size. (5) Straw weaving equipment. Straw bags are used for soybeans, rice, and other farm products. (6) Cooling roasted soybeans and hand cleaning for making kinako. (7) Soybean varieties: Lincoln, White Hilum Iwate, and Acadian (six photos, showing each variety wet and dry). (8) Wooden vats used for fermenting miso; each stands a little taller than a man, and is bound with 4 bamboo hoops. (9) Miso in wooden tubs [kegs] ready for market. (10) Hand assembly of wooden tubs for shipping miso and shoyu. (11) Stone mill for wet grinding of soybeans to make tofu. (12) A modern tofu shop, with boiler, pressure cooker, filter, and precipitation vat. Photos 11 and 12 courtesy of Sugiyama Chemical Research Inst., Tokyo. (13) Deep fat frying of tofu for making aburage. (14) Wooden kegs used for fermenting hamanatto. Stone weights are used to compact the beans during fermentation.

Other figures: (1) Flow diagram of the miso manufacturing process (incl. koji). (2) Table showing total production of miso in Japan (about 1957) as reported by All Japan Miso Industrial Association. Factory made miso consists of: Rice miso 379,000 tonnes (metric tons), barley miso 146,000 tonnes, soybean miso 58,000 tonnes, total factory made 583,000 tonnes. Homemade miso of all types is 391,000 tonnes (67% of factory made). Total factory and home made: 974,000 tonnes. Ingredients used in this grand total: Soybeans 361,000 tonnes, rice 115,000 tonnes, barley 58,000 tonnes, salt 159,000 tonnes. (3) Table showing nutritional composition of rice miso, barley miso, and soybean miso. (4) Table showing composition of sweet miso,

salty miso, and enriched miso. (5) Diagrammatic sketch of equipment used in making fresh tofu. (6) Flow diagram of a frozen tofu factory.

Note: The author was in Japan from Oct. 24 to Dec. 24, 1957. The principal localities visited were: Tokyo, Yokohama, Tochigi City, Nagano, Matsumoto, Suwa, Hamamatsu, Nagoya, Kyoto, Osaka, Fukuoka, Kumamoto, Nagasaki, and Sendai. His trip was sponsored by the Agricultural Research Service and the Foreign Agricultural Service of the USDA, and the American Soybean Association (Hudson, Iowa).

Note: This is the earliest document seen (July 2000) that mentions "barley miso"—a type of miso made with barley koji, soybeans, and salt. Address: Head of Meal Products Investigations, Oilseed Crops Lab., NRRL, Peoria, Illinois.

351. Smith, Allan K. 1958. Use of United States soybeans in Japan: Hamanatto (Document part). *USDA Agricultural Research Service*. ARS-71-12. iii + 36 p. April. See p. 29-31. April. Illust. 28 cm.

• **Summary:** "Hamanatto: Hamanatto, sometimes spelled hamananatto, is made by fermenting whole soybeans. Hamanatto is produced in a limited area in Japan in the vicinity of Hamanatsu [sic, Hamamatsu in Shizuoka Prefecture, central Japan]. Hamanatto should not be confused in any way with natto. The only resemblance between the two products is that both are made by fermenting whole soybeans. Hamanatto has a pleasant flavor resembling miso or shoyu but is sweeter. Factors unfavorable to the popularity of hamanatto seem to be its very dark color (black) and its rather high cost. Hamanatto is said to cost four times as much as miso.

"Hamanatto is reported to have come to Japan by way of Korea about 350 years ago at the time of the Japanese invasion of that country. Natto means 'contributed beans' and hamanatto was contributed to the Japanese warriors. The process is reported to have originated in Buddhist temples where it was developed as a source of protein. The ancestors of the people owning the Yamaya Brewery and the Saito Mido Plant of Hamanatsu [sic] are said to have inherited the process from the Buddhist monks.

"In making hamanatto the beans are soaked in water for 4 hours and steamed without pressure for 10 hours. The cooked beans are spread on the floor for cooling to 30°C. Koji prepared from roasted wheat or barley is sprinkled over the beans to cover their surface. The Japanese are very particular to cover the entire bean surface. The inoculated beans are placed in trays in a fermenting room for about 20 hours; during the fermentation the beans acquire a good coating of green mold. When taken from the fermenting room they are covered with a sticky material and must be separated and dried in the sun to about 12 percent moisture. This can be accomplished in one day if the weather is warm and sunny. At one factory the beans are carried to the roof for

drying.

“The dry beans are placed in wooden buckets [kegs, bound with bamboo hoops] that have a capacity of about 15 gallons. Strips of ginger are placed in the bottom of the buckets before adding the beans and the salt water to cover them. A [wooden] cover that fits inside the bucket is placed over the beans and a very heavy weight placed on the cover. Rough stones estimated to weigh about 100 pounds are used for weights. Figure 18 [a photo] shows the buckets with the stone weights used during fermentation, which requires 6 to 12 months and must include one full summer. During fermentation the beans acquire a dark reddish color that is not unpleasing. After fermentation is completed and the beans are dried in the sun, they turn black. Hamanatto contains about 11 percent salt, said to be the cause of their turning black. Hamanatto will keep at room temperature for 1 year or longer.

“The makers of hamanatto, now using only Japanese soybeans, prefer a very select grade grown only in Hokkaido because they are large, are uniform in size, and are free of foreign matter. They claim to pay ¥4,500 for 60 kg. of specially selected beans; an equal quantity of U.S. [soy] beans would cost them ¥3,000. On this basis the relative cost per 60-pound bushel of Hokkaido and U.S. soybeans is \$5.65 and \$3.80, respectively.

“An analysis [of Hamanatto] supplied by the Yamaha Brewery is as follows: Water 39 percent, total nitrogen 3.8 percent, water-soluble nitrogen 2.6 percent, reducing sugars 7.0 percent, total sugars 10 percent, crude fiber 12.5 percent, ash (including 11 percent sodium chloride) 12 percent, volatile acids 0.015 percent, total acids 1.2 percent, and pH of water suspension 5.1. The composition of hamanatto probably varies considerably.

“If hamanatto could be produced in dark red rather than black color and the process modernized to bring the cost more in line with other fermented soybean products, it should have much wider acceptance and use.”

Note 1. This is the earliest document seen (Nov. 2011) stating that Hamanatto [fermented black soybeans] were made at Yamaya temple in Hamamatsu.

Note 2. This is the earliest document seen (Jan. 2012) that uses the word “sticky” (or “stickiness,” etc.) to describe Hamanatto. Address: Head of Meal Products Investigations, Oilseed Crops Lab., NRRL, Peoria, Illinois.

352. Watanabe, Ken; Yoshikawa, Mitsuyoshi; Nonoguchi, Yoshitaka; Kondo, Seigo. 1958. [Studies on *Bacillus natto* protease. VI. Crystallization of an inhibitor of *Bacillus natto* protease present in potato]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 32(4):260-62. April. [15 ref. Jap]  
Address: Biochemical Lab., Hyogo Univ. of Agriculture, Hyogo-ken, Japan.

353. Inoue, Norimasa; Oshima, Takeichi. 1958. Futatabi nattô no eiseigaku-teki shiken [Further sanitary test of natto]. *Eiyogaku Zasshi (Japanese J. of Nutrition)* 16(3):91-92. June. [2 ref. Jap; eng]

• **Summary:** Fourteen samples of natto were obtained from the market, made by different makers in Tokyo. These included 7 samples in rice-straw packages and the same number on wood shavings. All were examined by isolation of *Aerobacter* type bacteria, with the following results.

(1) Ten samples were found to contain *Aerobacter* type bacteria (5 each straw and wood shaving packages).

(2) Among those ten, seven were identified to contain *Aerobacter aerogenes*, two to contain *Aerobacter cloacae*, and one to contain *Aerobacter mannanolyticus*. Address: National Nutritional Research Lab (Kokuritsu Eiyô Kenkyûsho).

354. Perissé, J. 1958. La consommation des légumineuses au Togo [The consumption of legumes in Togo]. Paris: Office de la Recherche Scientifique et Technique Outre-Mer. 20 p. Cote de Classement No. 4019. Rapport demandé par l'Organisation des Nations Unies pour l'Alimentation et l'Agriculture. [6 ref. Fre]

• **Summary:** Togo is sandwiched between Ghana on the east and Benin on the west. Prepared for FAO, this is the report of surveys conducted among the five major ethnic groups in Togo concerning the legumes they consumed and their nutritional contribution to each group's diet. One village from each group was surveyed in depth three times in 12 months. The groups are listed here from south to north: The Ouatchis eat mainly *haricot niébé* (*Vigna unguiculata*), plus small amounts of peanuts. The Ewes eat *niébé* (*Kasake*), *Phaseolus lunatus* (*Kpakpankui*), *le pois d'angole* (*nugune*), and peanuts. The Cabrais or Kabres eat (in order of importance) *haricot niébé*, peanuts, and *neré* (*Parkia biglobosa et Parkia oliveri*). Starchy foods include yam *igname*, taro, and manioc. A detailed description is given of how the *neré* are cooked, dehulled, fermented, and dried to make Soumbara [Soumbala]. The emigrant Cabrais eat *haricot niébé*, *le pois de terre* (*Voandzeia subterranea*) (*Suè*) (Bambarra groundnuts), peanuts, and *neré* (usually consumed in fritters—*beignets*). The Mobas (in the far north of Togo) eat the same legumes as the emigrant Cabrais. Peanut meal is used in fritters.

Soy is mentioned only in the Conclusion (p. 17): “For example, in the land the Outachis, it is probable that an improvement of the protein ration will be obtained more easily by an increase in the production of *haricot niébé* [*Vigna unguiculata*] which will be automatically accepted in the traditional form of *abobo* rather than asking the people to consume *neré* or soya-foods that would clash with the culinary traditions of thrift and with the tastes of the consumers.”

Note: 1997. Jan. 23. According to the French Consulate,

Science Section, this document may be ordered from the publisher: O.R.S.T.O.M., Attn: Bureau de Press et Communication, 213 Rue Lafayette, 75480 Paris, Cedex 10, France. Address: Pharmacien-Capitaine du Corps de Santé Colonial, Détache à l'Office de la Recherche Scientifique et Technique Outre-Mer [ORSTOM], 20, rue Monsieur, Paris VIII<sup>e</sup>, France.

355. Mogi, Masatoshi. 1958. [Shoyu, a Japanese sauce]. *Japanese Patent* 10,199. Nov. 25. (Chem. Abst. 53:4650a). [Jap]\*

• **Summary:** Koji is prepared from 550 gm soybeans, 129 gm wheat, and 66 gm soy wheat. Then 660 cc of 7.5% sodium chloride solution is added, and the mixture is inoculated with the enzyme glutaminase obtained from the natto bacterium, *Bacillus subtilis*. After 7 days, sodium chloride is added to 18% concentration. The mixture is kept at 30°C for 3 months to give shoyu containing 23.5 mg/cc glutamic acid. Address: Noda, Japan.

356. Chung, T.S.; Kim, C.J.; Whang, K.S. 1958. [Enzymological studies of the fermented soybean products. IV. Amino acid composition of natto proteins]. *Kwayon Huibo (Bulletin of the Scientific Research Institute, Korea)* 3(1):83-87. [Kor]\*

357. Chung, T.S.; Kim, C.J.; Yoon, D.S. 1958. [Enzymological studies of the fermented soybean products. III. Isolation of *B. natto* and their classification]. *Kwayon Huibo (Bulletin of the Scientific Research Institute, Korea)* 3(1):75-82. [Kor]\*

358. Tanegashima, C.; Kirita, Y. 1958. [Investigation of pyridine carbonic acids. I.]. *Mukogawa Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.—Domestic Science Series)* 6:105-09. [Jap]\*

359. Dean, R.F.A. 1958. Use of processed plant proteins as human food. In: A.M. Altschul, ed. 1958. *Processed Plant Protein Foodstuffs*. New York: Academic Press. xv + 955 p. See p. 205-47. Chap. 9. [99\* ref]

• **Summary:** Contents: General considerations: Early sources of protein for human food, competition for food between man and his domestic animals, vegetarianism and vitamin B-12, protein requirements (of children, of adults). Plant proteins now in use: Foods that can be prepared in the home (cereals, legumes {incl. groundnuts, soybean}, sunflower seed, sesame), plant foods used after factory processing (cereals, legumes, sunflower seed meal, cottonseed meal). Other forms of plant food: Plankton, algae, food yeast, leaf proteins (p. 237-38). Future extensions of the use of plant proteins: The theoretical basis of selection, assessment of the value of foods intended for human consumption, practical measures for the future.

In 1957 some 160,000 tons of soybeans were used to make tofu in Japan. “Magnesium or calcium salts are the precipitants of the curd from the soybean milk; the product is eaten by nearly every family in Japan with its breakfast miso-soup.”

During World War II, the attempt was made to introduce soya as a food crop to Uganda. But “no instruction was given in the necessary details of preparation, with the result that the crop was very reasonably declared inedible by the Africans. They retain a violent prejudice against it and are suspicious that it has been added to any food, such as yellow corn meal, that they find distasteful.

“One of the most interesting methods for making soya edible has evolved in Indonesia and was described in full by Van Veen and Schaeffer (1950). It takes advantage of the ability of the mold *Rhizopus oryzae* to grow on the bean and alter its constituents... The product made from soya is called *tempeh kedele* (kedele = soybean).” Details of the production process are given. A description of natto and its composition is also given (p. 218).

The section on algae gives detailed information on chlorella, a type photosynthetic single-cell protein. As early as 1954, Morimura and Tamiya in Japan were experimenting with the use of powdered *Chlorella ellipsoidea* in foods. Note: This is the earliest document seen (Aug. 1997—one of two documents) that mentions the use of algae or other photosynthetic single-cell protein as food.

The section on leaf proteins (p. 237-39) begins: “Protein synthesis is one of the chief activities of the leaf, and proteins are comparable to animal proteins in their amino acid composition (Lugg 1949). The young leaf is especially rich in protein...” Pirie (1953) has suggested a process for recovering the leaf protein from the fibrous residue left after mechanical separation; the protein is usually very difficult to free. Pirie (1953) has also described the likely structure of an efficient plant. “There are also obvious possibilities in such abundant and little-used material as the leaves of sugarcane, cassava, and bananas” (p. 238-39).

The section titled “Sesame” (p. 219-20) states that the Zande people of southwestern Sudan steep the seeds in water for a few minutes, then pound them lightly to loosen the outer coat. They then dry the seeds and the outer coat is sieved or winnowed away. The seeds are then roasted and ground to a paste, which is sometimes used to make a sauce (Culwick 1950). “The use of sesame as a sweetmeat or condiment is fairly widespread in the Near East. A sweetmeat called *tahinya* or *tahina* is made in the Gezira [Sudan] by cooking the roasted seeds in sugar; sometimes the seeds are crushed before the cooking, and sometimes not” (Culwick 1951). Describes how to make the condiment. Address: Medical Research Council, Mulago Hospital, Kampala, Uganda.

360. Itami, Kenkichi; Kato, Sumio. 1958. *Nattô oyobi nattô-*

kin no bitamin B-2 ryô ni tsuite [Riboflavin (vitamin B-2) content of natto and *Bacillus natto*]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 10(4):206-08. [6 ref. Jap; eng]

361. Miyake, Suguru; Watanabe, Ken; Nonoguchi, Yoshitaka; Saeki, Takamichi. 1958. Nattô-kin tanpakushitsu benkai kôso ni kansuru kenkyû. VII. Kesshō protease no seishitsu ni tsuite [The studies on *Bacillus natto* protease. VII. Several properties of crystalline protease]. *Hyogo Noka Daigaku Kenkyu Hokoku, Nogaku-hen (Science Reports of the Hyogo University of Agriculture)* 3(2):97-100. [15 ref. Jap; eng]

• **Summary:** “The properties of a crystalline preparation of protease obtained from cultures of *Bacillus natto* were studied. The optimum pH of the enzyme for digestion of casein and gelatin was found to be 8.2 and the optimum temperature was approximately 55°C.” The enzyme was found to be stable after heat treatment for 10 minutes at 45°C, but it was inactivated above this temperature. Address: Biochemical Lab.

362. Motoyama, Tekishu. 1958. Inshoku jiten [Encyclopedia of food and drink]. Tokyo: Heibonsha. 604 p. Illust. 27 cm. [Jap]

• **Summary:** Includes listings for the following soy-related terms: Aburage (deep-fried tofu pouches), aemono (Japanese-style salads), agedashi-dofu, daizu (soybeans), dengaku, fu (wheat gluten; but the term “seitan” is not listed in this book), ganmodoki (tofu burgers), gisei-dofu, gomado-fu (sesame tofu), goma-miso (sesame miso), inari-zushi, iri-dofu (scrambled tofu), kenchin-jiru, miso, namemiso, natto, oboro-dofu (soymilk curds), oden (stew), okara, shirae (tofu salad), shoyu, sukiyaki, tekka, teriyaki, tofu, tonyu (soymilk), tsuto-dofu, unohana (okara), yakimiso (broiled miso), yuba.

Separate entries, with detailed information, are given for some of the above words or terms.

363. Sekiguchi, R. 1958. [Manufacture of natto]. In: How to Manufacture and Cook Natto. Tokyo: Taibunkan Co., Ltd. See p. 110-63. [Jap]\*

364. Watanabe, Ken; Kitayama, Norio; Matsushita, Isao. 1959. Nattô-kin tanpaku bunkai kôso ni kansuru kenkyû. VIII. Ion kôkan jushi ni yoru seisei kesshō-ka ni tsuite Studies on *Bacillus natto* proteinase. VIII. The purification and crystallization of *Bacillus natto* proteinase using the ion exchange resin. *Hyogo Noka Daigaku Kenkyu Hokoku, Nogaku-hen (Science Reports of the Hyogo University of Agriculture)* 4(1):69-72. [4 ref. Jap; eng]  
Address: Biochemical lab.

365. Hayashi, Uichi. 1959. Nattô ni kansuru kenkyû. I.

[Studies on natto. I. Search for a strain of *Bacillus natto* suited to use at a lower temperature]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 37(6):233-42. [30 ref. Jap; eng]

Address: Osaka Municipal Hygienic Laboratory, Japan (Osaka Shiritsu Eisei Kenkyujo).

366. Hayashi, Uichi. 1959. Nattô ni kansuru kenkyû. II. [Studies on natto. II. Enzymatic protein-decomposing capacity of *Bacillus natto* Sawamura strain No. 11 Hayashi]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 37(7):272-75. July. [12 ref. Jap; eng]

Address: Osaka Municipal Hygienic Laboratory, Japan.

367. Hayashi, Uichi. 1959. Nattô ni kansuru kenkyû. III. [Studies on natto. III. The quality of natto in its relation to the time of soaking soybeans in water and to the pH value of it]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 37(7):276-80. July. [5 ref. Jap; eng]

• **Summary:** One of the most comprehensive studies of natto to date. The addition of H<sub>3</sub>PO<sub>4</sub> (phosphoric acid, 0.05 to 0.1%) to the soaking water of dry soybeans to be used in making natto seemed to increase the storage life of the natto yet did not affect its taste or overall quality.

Hayashi's data indicated that there was no change in the fat and fiber contents of soybeans during a 24 hour period of fermentation, but that the carbohydrates [which cause flatulence] almost totally disappeared. A great increase in water-soluble and ammonia nitrogen was reported during fermentation as well as during storage. The amino acid composition was unchanged. Boiling significantly decreased the thiamine content of soybeans; but fermentation by *Bacillus natto* increased the thiamine content of natto to approximately the same level as that of the soybeans before boiling. The riboflavin content of natto was much greater than that in soybeans. Address: Osaka Municipal Hygienic Laboratory, Japan.

368. Obata, Yataro; Matano, Kagenori. 1959. Nattô kôki ni kansuru kenkyû. I. Kihatsu-sei sansei busshitsu no kensaku [Studies on the flavor of natto. I. Identification of volatile acidic compounds by paper chromatography]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 33(7):567-69. July (Chem. Abst. 57:15569. 1962). [7 ref. Jap]

Address: Dep. of Agricultural Chemistry, Faculty of Agriculture, Hokkaido Univ., Sapporo, Japan.

369. Obata, Yataro; Matano, Kagenori. 1959. [Studies on the flavor of natto. II. On the change of diacetyl contents during the course of natto manufacture]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 33(7):569-71. July. [7 ref. Jap]

Address: Dep. of Agricultural Chemistry, Faculty of

Agriculture, Hokkaido Univ., Sapporo, Japan.

370. Hayashi, Shizuka. 1959. Japanese users react to U.S. beans. *Soybean Digest*. Aug. p. 34.

• **Summary:** “The fact that soybean in Japan are used 100% as food should by now be well realized by those in the soybean industry as well as by the growers. It has been repeatedly emphasized that soybean trade between the United States and Japan is to be based on the complete understanding of this fact.”

One of the first projects of JASI “was to find out the causes of the unpopularity of U.S. soybeans among the Japanese users, especially the manufacturers of soybean products.” The major complaints concern excessive “foreign material, broken beans, irregularity of sizes, and mixture of different varieties received. All these problems have been time and again called to the attention of interested parties in the United States.” Considerable improvement has been made but there is still work to do. “The writer believes in the very near future specific varieties can be chosen for different food manufacturers and business will be done on the basis of [those] specific varieties.”

A list gives the specifications for soybeans desired by Japanese oil processors (6 specs), miso manufacturers (3 specs), shoyu makers (3), tofu makers (2), frozen tofu makers (1), kinako makers (3), and natto makers (3). For example, for miso: (1) Soybeans with white hilum with rich protein content and of big size are preferred. (2) Soybeans should be stored separately by varieties [identity preserved]. (3) Foreign material, especially seeds of other plants, sand and stones should be eliminated.

And for tofu: (1) Soybeans should be rich in protein content with thin seedcoat. (2) Soybeans should be free from foreign material, especially that of poisonous seeds of other plants.

A photo shows Shizuka Hayashi tasting miso made from the U.S. soybean varieties Dorman, Mamloxi, and Jackson at the Inamari miso factory in Shizuoka city. Arthur Rollefson, U.S. assistant agricultural attache, is also shown.

Note: This is the earliest document seen (Feb. 2010) that introduces the concept of “identity preserved” (“Soybeans should be stored separately by varieties”). Address: Japanese-American Soybean Inst., Tokyo.

371. Hayashi, Uichi. 1959. Nattô ni kansuru kenkyû. IV. [Studies on natto. IV. The production of natto at the room temperature of 20°C]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 37(8):327-29. [Jap; eng] Address: Osaka Municipal Hygienic Laboratory, Japan.

372. Hayashi, Uichi. 1959. Nattô ni kansuru kenkyû. V. [Studies on natto. V. Relation between the humidity in the fermentation room and the quality of natto]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 37(8):329-32. [5 ref.

Jap; eng]

Address: Osaka Municipal Hygienic Laboratory, Japan.

373. Nakano, Masahiro. 1959. Traditional methods of food processing. Paper presented at Regional Seminar on Food Technology for Asia and the Far East. 15 p. Held 1-8 Aug. 1959 at Mysore, India. [Eng]

• **Summary:** Contents: General. Soybean foods: Miso, syoyu (soy sauce), aspects on the miso and syoyu, natto, tofu, koridofu. Technological methods of food processing: Koji, miso, syoyu [shoyu] (soy sauce), natto, tofu. Conclusion.

Note: This paper was sent as a gift, with note and autograph, to Dr. A.K. Smith of the Northern Regional Research Lab., Peoria, Illinois. Address: Food Research Inst., Ministry of Agriculture and Forestry, Tokyo, Japan.

374. Sapin, P. 1959. Le soja dans le monde [The soybean in various countries of the world]. *Bulletin Agricole du Congo Belge et du Ruanda-Urundi* 50(4):897-948. Aug. [39 ref. Fre; dut]

• **Summary:** This articles focus on soya at Yangambi in the Belgian Congo. Content: Introduction. Climatic adaptation: Comparison of the climates in Harbin (central Manchuria) and Yangambi (near the equator), photoperiodic and thermal characteristics of soybeans, comparative study of the behavior of soya at Yangambi and its main zones of cultivation, eco-climatic chart of soya, classification of soybeans (*des sojas*) into fundamental climatic types and directives for the realization of their introduction to Yangambi. Selection: Classification of the soybean varieties, genetics, and selection. The cultivation of soya. Characteristics of the seed and its utilization: Composition of the seed, Oriental preparations based on soya (soy sprouts, soymilk, tofu, natto, Hamanatto, yuba, miso, soy sauce or shoyu), soy oil and by-products, soybean cake, use of soya in the West. A glance at soybean production. The situation in the Belgian Congo.

The author identified a number of soybean varieties adapted to different ecological zones in the tropics, which helped soybeans spread to tropical countries, especially in Africa. Address: Assistant à la Division des Plantes Vivrières de l'INÉAC, à Yangambi [Belgian Congo].

375. Hayashi, Uichi. 1959. Nattô ni kansuru kenkyû. VI. [Studies on natto. VI. Effect of substances added to the steep water on the quality of natto]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 37(9):360-68. [2 ref. Jap; eng] Address: Osaka Municipal Hygienic Laboratory, Japan.

376. Hayashi, Uichi. 1959. Nattô no eiyô-ka ni kansuru jikken-teki kenkyû. I. [Experimental studies of the nutritive value of “natto” (a fermented soybean). I. On the quantitative changes of dry matter, fats, carbohydrates and nitrogen compounds in the manufacturing process of natto]. *Kokumin*

*Eisei (Japanese J. of the Nation's Health)* 28(3):568-73. Sept. [15 ref. Jap; eng]  
Address: Osaka Municipal Hygienic Laboratory, Japan (Osaka Shiritsu Eisei Kenkyusho).

377. Hayashi, Uichi. 1959. Nattô no eiyô-ka ni kansuru jikken-teki kenkyû. II. [Experimental studies of the nutritive value of "natto" (a fermented soybean). II. On the changes of vitamin B-2 and B-2 amounts for natto in its manufacturing process]. *Kokumin Eisei (Japanese J. of the Nation's Health)* 28(3):574-79. Sept. [11 ref. Jap; eng]  
Address: Osaka Municipal Hygienic Laboratory, Japan (Osaka Shiritsu Eisei Kenkyusho).

378. Hayashi, Uichi. 1959. Nattô no eiyô-ka ni kansuru jikken-teki kenkyû. III. [Experimental studies of the nutritive value of "natto" (a fermented soybean). III. On the digestibility and the biological value of protein in natto and other soybean foods]. *Kokumin Eisei (Japanese J. of the Nation's Health)* 28(3):580-87. Sept. [9 ref. Jap; eng]  
• **Summary:** The protein quality of natto (70) was the highest, followed by boiled soybeans, then roasted soy flour (kinako). Address: Osaka Municipal Hygienic Laboratory, Japan (Osaka Shiritsu Eisei Kenkyusho).

379. Hayashi, Uichi. 1959. Nattô no eiyô-ka ni kansuru jikken-teki kenkyû. IV. [Experimental studies of the nutritive value of "natto" (a fermented soybean). IV. On the feeding experiment by natto and other soybean products]. *Kokumin Eisei (Japanese J. of the Nation's Health)* 28(3):588-96. Sept. [4 ref. Jap; eng]  
Address: Osaka Municipal Hygienic Laboratory, Japan (Osaka Shiritsu Eisei Kenkyusho).

380. Hayashi, Uichi. 1959. Nattô-kin no shôkakan-nai ni okeru taido ni tsuite [On the attitude of natto bacilli in the digestive canal]. *Kokumin Eisei (Japanese J. of the Nation's Health)* 28(3):597-500. Sept. [5 ref. Jap; eng]  
Address: Osaka Municipal Hygienic Laboratory, Japan (Osaka Shiritsu Eisei Kenkyusho).

381. *FAO Nutrition Meetings Report Series*. 1959. Report of the FAO/UNICEF Regional School Feeding Seminar for Asia and the Far East. No. 22. 53 p. Held 10-19 Nov. 1958 at Tokyo, Japan. [5 soy ref]  
• **Summary:** UNICEF stands for the United Nations International Children's Emergency Fund. Appendix 3 (p. 48-51) titled "Data on some nutritious food products that have been developed in Asia and the Far East," discusses Saridele, groundnut extract curd [tofu made from peanut milk], Indian Multipurpose Food (MPF, developed by CFTRI), miso, natto, and tempeh.

"Saridele" is the name that has been given to a spray-dried soybean extract combined with an extract of sesame,

or peanut, with or without the addition of malt. Vitamins and calcium are added to saridele in order to make its nutritive value similar to that of cow's milk or to enhance its nutritive value. Flavorings such as vanilla or chocolate are also used, which make the product highly acceptable.

"A plant having a capacity of about 800 kg./day has been erected in Indonesia with the financial assistance of UNICEF and the technical assistance of FAO. Saridele is manufactured from a mixture of soybeans and decorticated sesame in the proportion of 4:1. Malt extract from maize may be used to replace 50% of the cane sugar used. Soybean and sesame are soaked for about six hours and then disintegrated finely, together with 7 volumes of hot water. The slurry is stirred vigorously and then filtered. The filtered liquid is heated under pressure for 10 minutes at 120°C., then flashcooled and formulated with Vitamin A, in oil solution, and malt, if desired. The formulated liquid is homogenized, concentrated in a vacuum evaporator to about 22% solids, then spray-dried. The powder finally is sifted and blended with finely ground cane sugar, and calcium carbonate, riboflavin, ascorbic acid and Vitamin B<sub>12</sub> added; the mixture may be flavored with vanilla or chocolate." A table compares the nutritional composition of whole dried cow's milk and Saridele (based on a leaflet from Saridele Ltd., Indonesia). Address: FAO, Rome.

382. *Soybean Digest*. 1959. Soybean recipe book issued by Institute. Dec. p. 25.

• **Summary:** The Japanese-American Soybean Institute (JASI) recently issued a "Book of Recipes Using Soybeans." Edited by the Japan Nutrition Association (JNA), this booklet includes 108 recipes which have been introduced by the JNA at 2,200 "short courses in dietary improvement" held last year at the 800 Japanese health centers. Attendance at these courses (which were partly sponsored by JASI) was 220,000 people! The booklet, which is available at the health centers, contains articles on frozen and bagged tofu, shoyu, miso, natto, and "golden ajinomoto" (a seasoning made by the Ajinomoto Company).

383. Taira, Harue; Ebisawa, H.; Sugimura, K.; Sakurai, Y. 1959. Daizu kakôhin no amino-san ni kansuru kenkyû. I. [Studies on amino acid contents of processed soybean. I. Total amino acids of soybean products (Abstract)]. *Shokuryo Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 14. p. 95. Dec. [1 ref. Jap]

• **Summary:** Amino acid content of the following are given: Two soybean varieties, tofu, deep-fried tofu pouches (aburage), okara, dried frozen tofu, yuba, kinako, natto, and soymilk. Reprinted from *Eiyo to Shokuryo* 11(6):351 (1959). Address: 1-2. Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

384. Cheong, T.S.; Ke, S.Y.; Yoon, D.S. 1959. Studies on



the nutritive value of natto and heated soybean products. *Kwayon Huibo (Bulletin of the Scientific Research Institute, Korea)* 4(1):41-45. \*

• **Summary:** Fermented soy products are reported to be more digestible and of higher nutritive value than the raw beans.

385. Ebata, N.; Uno, R. 1959. [On the protein digestive power of *Bac. natto*]. *Scientific Report of the Faculty of Liberal Arts Education, Gifu University* 2:284-88. [Jap]\*

386. Masao, H. 1959. [Studies on natto and natto bacilli. III. Hygienic studies]. *J. of the Nihon Medical University* 26:540-47. \*

387. Miura, T. 1959. [Influence of natto and miso on growth and nitrogen metabolism in normal rats. (I) (II)]. *Nippon Shonika Gakkai Zasshi (Acta Paediatrica Japonica)* 63:2241-54. [Jap; eng]\*

388. Taira, Hirokadzu; Ebisawa, H.; Sugimura, K.; Sakurai, Y. 1959. Daizu kakô-hin no amino-san in kansuru kenkyû. I. Shoshu shihan daizu seihin no zen amino-san ganryô [Studies on amino acid content of processed soybeans. I. Total amino acids of soybean products]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 11(6):351-54. [12 ref. Jap; eng]

• **Summary:** The total amino acid content of 16 kinds of soybean products were determined by microbiological assay method. These included tofu, fried tofu pouches (abura-age), okara, dried-frozen tofu, yuba, kinako (roasted full-fat soy flour), natto, and nyu-fu (fermented tofu). Address: National Food Research Inst., Tokyo.

389. Hayashi, Shizuka. 1960. Public relations seminar by JASI. *Soybean Digest*. March. p. 20.

• **Summary:** At this seminar JASI taught Japanese manufacturers of soybean [food] products how sales of these products can be much increased through the use of public relations, including marketing research. "This is particularly true of marketing new products." Previously, these very manufacturers have lacked interest in public relations because they "have been enjoying a reasonably profitable business under the funds allocation system, which has afforded them a sort of protection."

At JASI's first seminar on PR [public relations] and marketing, held recently in Tokyo, about 40 companies and organizations from various parts of Japan participated. "There were two lectures. The first was by Professor Naoyoshi Horikawa on public relations and top management. The other, by T. Shimizu, was on sales promotion. Never in the history of the soybean industry [in Japan] has there been a gathering like this where the so-called 'big shots' of leading organizations sat side by side at the table."

A table shows estimated consumption of soybeans

(S) and soybean meal (SM) during 1961 as planned by the Japanese government (tonnes = metric tons). The totals are 1.467 million tonnes of soybeans and 707,000 tonnes of soybean meal. Details: Oil processing: 928,000 S. Livestock feed: 303,000 SM. Tofu and fried tofu: 280,000 S + 20,000 SM. Shoyu: 29,000 S + 200,000 SM. Miso: 130,000 S + 50,000 SM. MSG: 73,000 SM. Other miscellaneous foods: 20,000 S + 40,000 SM. Frozen tofu: 40,000 S. Natto: 30,000 S. Other uses: 21,000 SM. Kinako: 10,000 S.

Note: This is the earliest document seen (Jan. 2012) that contains industry or market statistics for natto by geographical region.

A large photo shows about 13 Japanese men seated at a long table at JASI's recent public relations seminar. The name and position of each man is given. They represented the following organizations: Miso Association. Tatsuno Shoyu. Shoyu Association. Frozen Tofu Association. Masuko Miso. Address: Managing Director, Japanese American Soybean Inst., Nikkatsu International Building, No. 1-Chome Yurakucho Chiyoda-Ku, Tokyo, Japan.

390. Hayashi, Uichi. 1960. Nattô ni kansuru kenkyû. VII. Nattô-kin no baiyô hôhô [Studies on natto. VII. The culture method of the natto bacillus]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 38(5):210-13. [2 ref. Jap; eng] Address: Osaka Municipal Hygienic Lab., Osaka, Japan.

391. Hayashi, Uichi. 1960. Nattô ni kansuru kenkyû. VIII. [Studies on natto. VIII. Influence of carbon dioxide gas in the fermentation room]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 38(5):213-16. [4 ref. Jap; eng] Address: Osaka Municipal Hygienic Laboratory, Japan.

392. Hayashi, Uichi. 1960. Nattô ni kansuru kenkyû. IX. [Studies on natto. IX. Effects of formalin on the fermentation]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 38(5):216-18. [Jap; eng] Address: Osaka Municipal Hygienic Laboratory, Japan.

393. Hayashi, Uichi. 1960. Nattô ni kansuru kenkyû. X. [Studies on natto. X. Manufacture of calcium-enriched natto]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 38(6):255-58. [1 ref. Jap; eng] Address: Osaka Municipal Hygienic Laboratory, Japan.

394. Hayashi, Uichi. 1960. Nattô ni kansuru kenkyû. XI. [Studies on natto. XI. Manufacture of miso (soybean paste) utilizing natto]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 38:258-60. [7 ref. Jap; eng] Address: Osaka Municipal Hygienic Laboratory, Japan.

395. Smith, Allan K.; Watanabe, Tokuji; Nash, Arlo M. 1960. Tofu from Japanese and United States soybeans. *Food Technology* 14(7):332-36. July. [8 ref]

• **Summary:** Most of the U.S. soybeans exported to Japan are processed for oil and meal that are used for making food products. A survey conducted in 1957 in Japan by A.K. Smith (“Use of U.S. soybeans in Japan,” published April 1958) indicated that at least 25 million bushels of whole soybeans were used in making traditional Japanese foods such as miso, tofu, and natto, and that the Japanese wished to use more.

This paper describes pilot plant investigations comparing U.S. and Japanese soybean varieties to determine which U.S. varieties make the best tofu. Lee and Jackson varieties appeared to make tofu equal in yield, flavor, texture, and color to Japanese soybeans. “When such varieties are known to U.S. exporters and Japanese importers, more soybeans may be exported to Japan ‘identity preserved’ at some increase in cost over the U.S. No. 2 yellow beans” (p. 332-33).

Note: This is the earliest document seen (Feb. 2010) that uses the term “identity preserved” to refer to soybeans. Address: 1. NRRL, Peoria, Illinois; 2. Food Research Inst., Ministry of Agriculture and Forestry, Tokyo, Japan.

396. USDA ARS Northern Utilization Research and Development Division, Peoria, Illinois. 1960. Definitions of foreign foods of current interest (Brochure). Peoria, Illinois. 4 p. 28 cm.

• **Summary:** The first section, titled “Japanese foods from soybeans” (p. 1-2) includes: Aburage, frozen tofu, Hamanatto, kinako, koji, kori tofu, miso, monosodium glutamate (a seasoning compound first isolated from soy sauce), nama-age, natto, satsumage, soybean milk or tonyu, soy sauce or shoyu, tofu, yaki-dofu, yuba.

The second section, titled “Indonesian fermented foods” (p. 3-4) includes: Arak, ketjap (soy sauce made with black soybeans), ontjom, ragi, sajur asin, tapé ketan (fermented glutinous rice), tapé katella (fermented arrowroot), tempeh (or témpé or témpé kedelé), tuwak. Address: Peoria, Illinois.

397. Hibino, H.; Mano, M.; Innishi, M. 1960. [Enzymatic decomposition of protein by *Bacillus natto*]. *Bulletin of Nagoya Women's City College* 9:37-38. [Jap]\*

398. Kohono, C. 1960. [Investigation of organic acids of natto]. *Mukogawa Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.—Domestic Science Series)* 8:201-205. [Jap]\*

• **Summary:** 2008 Aug. 12. WRS e-mailed [www.nodai.ac.jp/english/](http://www.nodai.ac.jp/english/)... = Tokyo University of Agriculture.

The one I've been to is University Library for Agricultural and Life Sciences at 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-8657.

399. Sakurai, Yoshito. 1960. Report of the researches on the production of high-protein food from fermented soybean

products. Food Research Institute, Ministry of Agriculture and Forestry, Tokyo, Japan. \*

• **Summary:** Sakurai reconfirmed that *Bacillus natto* is an aerobic, Gram-positive rod, and classified as a related strain of *B. subtilis*.

Note: Hesselstine and Wang (1972, p. 402) reported that there are two types of *Bacillus natto* in the laboratory of the Food Research Institute, Ministry of Agriculture and Forestry, Tokyo, Japan. One has its optimum temperature from 30° to 45°C and the other, from 35° to 45°C.

Sakurai recommended that the culture known as *B. natto* SB-3010 and having its optimum temperature from 35° to 45°C appeared to be the one most suitable for making natto. Address: National Food Research Inst., Tokyo.

400. Doi, Tadao. ed. 1960. Nippo Jisho: Vocabulario da lingua de Iapam [Vocabulary of the language of Japan]. Tokyo: Iwanami Shoten. 822 p. 22 cm. [Por; Jap]

• **Summary:** This is facsimile edition of the original 1603 edition, the second earliest dictionary of the Japanese language compiled by Europeans.

Soy-related terms in this dictionary include: Abura age [Abura-agé]. Aburidôfu. Amazaqe [Amazake]. Cabe [Tofu]. Côji [Koji]. Daizzu [Daizu]. Dengacu [Dengaku]. Fanben [Hanben]. Icchô. Mame. Graos, ou feijoes de Iapam [Soybeans]. Miso [made with rice]. Misocoxi [Misokoshi, a miso strainer]. Misoya [A shop which sells miso]. Misoyaqijiru [Miso-yaki-jiru, a soup made with grilled miso and diced tofu]. Misôzzu [probably a soup seasoned with miso resembling Zosui]. Nattô. Nattôjiru. Tofu. Tofuya [A shop which makes and sells tofu]. Tamari. Vdondôfu [Udon-dôfu]. Xôyu [Shoyu, or soy sauce]. Yudôfu. Address: Nagasaki College of Japan.

401. Hayashi, Y.; Ariyama, H. 1960. Daizu oyobi sono kakôhin no eiyô-ka ni kansuru kenkyû [Studies on the nutritive value of the soybean and its products]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 13:297-99. [4 ref. Jap; eng]

402. Joya, Mock. 1960. Things Japanese. Tokyo: Tokyo News Service, Ltd. [vi] + 782 + xlv p. Index. 21 cm.

• **Summary:** In Chapter 7, titled “Food, ‘Sake’ and Tobacco” (p. 275-331) the following may be of interest: Asakusa-nori (includes shoyu), azuki (incl. soybeans, tofu, miso, shoyu, natto), bento and kashi, cattle, chameshi, chawan-mushi (“somewhat similar to Western custards.” Make katsuobushi (shaved dried bonito) soup stock, cool, pour into individual *chawan-mushi* bowls (each has a cover). Mix in an equal quantity of beaten eggs. Add additional flavoring ingredients, cover, and steam until set. “One of the few Japanese dishes that resemble Western dishes in taste”).

Chazuke, cooking (incl. sukiyaki and tempura), daikon (incl. miso), drinking cups and customs, eel-eating day (eels

are broiled, steamed, then put in a specially prepared shoyu and broiled again), ginnan (ginkgo nuts), gobo (burdock, incl. miso soup and shoyu), gohan (boiled rice), kabayaki (eel), kamaboko, kashi (confections and sugar), katsuobushi (incl. shoyu), kawara-senbei (incl. miso), konnyaku (its shredded form, called shirataki, is used in sukiyaki), manju, matsutake mushrooms (widely used in sukiyaki in the fall), menrui (noodles, incl. soba, udon, shoyu), mikan (mandarin oranges), misoshiru (miso soup, incl. tofu, shoyu, tekka-miso, tai-miso, yuzu-miso, wakame), mochi, mochitsuki (pounding), myoga (*Zingiber mioga*), oden (with tofu, miso, and shoyu), one-sided fish, red rice (*sekihan*, made with azuki = red beans), ringo (apples), sakana (fish, incl. shoyu and tofu), sake drinking, sake eating, sashimi (incl. shoyu and mirin), satsuma-imo, seaweeds (sea vegetables), shincha (new tea), shoyu (Japanese-style soy sauce; per capita consumption is nearly 4 gallons a year), snake eaters, soba (incl. shoyu), souvenir cakes, sugar, suimono (clear soup, incl. miso and shoyu), sukiyaki (incl. tofu and shoyu), sushi (incl. Inari-zushi made with fried tofu), sweets in season, tea varieties, tea water, tempura (incl. sesame oil and shoyu), tobacco tradition, tofu (incl. bittern/nigari, yakidofu, aburage, ganmodoki, Koya-dofu, fried tofu, hiyayakko, sukiyaki, dengaku, miso, miso-shiru, shoyu), tokoroten (kanten, tengusa), tsukemono (pickles, incl. miso), umeboshi, wasabi (incl. shoyu), yasai (vegetables), yokan, and yonaki-soba. Note: Different types of yokan (yōkan, a paste made of azuki beans and sugar) include: mizu-yokan (soft azuki-bean jelly) and mushi-yokan (steamed yokan). Yokan-iro is a liver or rusty color.

Other subjects related to soy: Home cures (p. 66-67, for burns, apply the white of an egg or shoyu). Setsubun (p. 119, incl. mame-maki or throwing roasted soybeans). Brother mountains (p. 192, the most loved one, Fudo-iwa, was fed azuki or red beans but the unloved Gongen-yama was fed soya beans). Fox messengers (p. 207-08, aburage or fried tofu). Kuyo (p. 373-74, incl. hari-kuyo or mass for broken needles—but tofu is not mentioned). Azuki (p. 276-77). Red rice (*sekihan*, p. 303). Lunar calendar (p. 400, setsubun and bean throwing). Bamboo (p. 410, incl. bamboo shoots served with shoyu). Hi-no-kami (p. 474, incl. amazake). Sacred rice (p. 504, incl. setsubun and throwing roasted soybeans). Shoulder-chipped Jizo (p. 517, concerns the stone statue of Jozo at the Kiunji Temple, Tozaki-machi, Bunkyo-ku, Tokyo, and foxes and a tofu shop). Inari-san (p. 616-17, Inari-sushi and aburage). Address: Japan.

403. Kihara, Yoshijiro; Takeuchi, Etsuko. 1960. [Organic acids in food products. I. Estimation of organic acids in food products by column chromatography]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 13(4):253-57. (Chem. Abst. 59:12077). [3 ref. Jap]\*

• **Summary:** The organic acids in the food products such as soy sauce, soybean paste (miso), natto, pickle, vinegar,

tea, coffee, bread etc. were estimated by the silica gel column chromatography. The kinds of the raw materials and the processing methods gave remarkable effects on the distribution of organic acids in each food product.

Soy sauces which were suspected to contain the acid-hydrolysate of soybean showed the presence of levulinic acid.

The miso varieties, fermented for a longer time, contained valeric [pentanoic], butyric and propionic acid, while only acetic acid was detected in the other products as volatile acid. (From journal@rchive).

404. Umeda, Isao; Ebine, H.; et al. 1960. Hakkō shokuhin [Fermented foods]. Tokyo: Kyoritsu Shuppan Co., Ltd. Microbiological Industry Series. [Jap]\*

405. Kihara, Yoshijiro; Matoba, Nariko; Nanba, Rimiko. 1961. Nattō no seibun ni tsuite. I. Nattō no tō oyobi nenshitsu-butsumi ni tsuite [Chemical constituents of natto. I. Sugars and mucilage in natto]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 35(1):57-61. Jan. [7 ref. Jap]  
Address: Lab. of Food Chemistry, Faculty of Home Economics, Ochanomizu Univ., Tokyo, Japan (Ochanomizu Joshi-Daigaku, Shokuhin Kagaku Kenkyūshitsu).

406. Diser, Gleason M. comp. 1961. Glossary of soybean terms. *Soybean Blue Book*. p. 61-64.

• **Summary:** This is the first glossary with this title in the *Soybean Blue Book*. However in the first *Blue Book* (1947, p. 17-19) there was a somewhat similar section titled “Terminology: Definitions and product descriptions for the soybean industry.”

The following terms are defined in this glossary: Soybean(s), soybean processor, soybean processing (solvent extraction, mechanical pressing, hydraulic pressing), soybean oil, crude soybean oil, edible crude soybean oil, refined soybean oil, edible refined soybean oil, hydrogenated soybean oil, degummed soybean oil, winterized oil, technical grade refined soybean oil, soybean fatty acids, soybean soapstock, acidulated soybean soapstock, soybean lecithin, break material, sludge.

Soybean products: Ground soybeans, soybean hay meal, soybean flakes, 44% protein soybean oil meal, dehulled soybean flakes, 50% protein solvent extracted soybean oil meal, soybean proteins, soy flour, soy grits, soybean oil meal, defatted soy flour, low-fat soy flour, high-fat soy flour, full-fat soy flour, lecithinated soy flour, protein, isolated protein, toasting. Oriental soy foods: Soy sauce (shoyu), soy milk, miso, frozen tofu, aburaage, kinako, namaage, ganmodoki, tempeh, natto, yuba, moyashi (soybean sprouts). Address: Archer-Daniels-Midland Co., Minneapolis, Minnesota.

407. Shurpalekar, S.R.; Chandrasekhara, M.R.;

Swaminathan, M.; Subrahmanyam, V. 1961. Chemical composition and nutritive value of soyabean and soyabean products. *Food Science (Mysore, India)* 10(3):52-64. March. Published in 1961 as a 32-page book by the Soybean Council of America in Hamburg, Germany. [178 ref]

• **Summary:** Contents: Introduction. Chemical composition and nutritive value. Soyabean oil. Carbohydrate in soyabean. Minerals in soyabean. Vitamins in soyabean. Factors affecting nutritive value: Trypsin and growth inhibitors, heat processing, other factors. Digestibility and biological value: Animal experiments, supplementation with sulphur amino acids, human feeding experiments. Supplementary value to other food proteins. Processed foods from soyabean: Soyabean milk, dried milk substitutes from soyabean, malt foods containing soyabean, soyabean flour, multipurpose food (fortified soyaflour), dehydrated soup mixture, balanced food, soyabean protein isolate. Fermented soyabean products: Soy sauce, tofu or soyabean curd, miso, natto, tempeh. Conclusion.

Note 1. This is the earliest document seen (Jan. 2001) from India that mentions tempeh.

Note 2. This is the earliest English-language document seen (Aug. 2003) that contains the term “soyabean protein” (or “soyabean proteins”).

Note 3. This is the earliest English-language document seen (Aug. 2003) that contains the term “soyabean protein isolate” (or “soyabean protein isolates”). Address: Central Food Technological Research Inst. (CFTRI), Mysore, India.

408. Smith, Allan K.; Wolf, Walter J. 1961. Food uses and properties of soybean protein. I. Food uses. *Food Technology* 15(5):4-6, 8, 10. May. [34 ref]

• **Summary:** Contents: Summary. Introduction. Commercial soybean protein fractions. Soybean foods: Soybean varieties (garden varieties vs. field varieties, main differences between them, U.S. soybean breeding program). Trends in protein requirements (worldwide protein shortage). Soybeans and fractions used in food: Whole soybeans, defatted soybean meal, isolated proteins, protein concentrate (called “protein concentrate 70” in the summary), Gelsoy.

Whole soybeans may be baked or boiled, or used to make sprouts, fresh or dried tofu, vegetable milk (or “soybean milk”), yuba, and many fermented food products, including “miso or soy paste, natto, hamanatto, shoyu (soy sauce), tempeh, and some less important foods.”

“Protein concentrate: Extraction of dehulled and defatted meal with dilute acid (pH 4.5) removes soluble sugars, nonprotein nitrogen, and other low-molecular weight components and a small amount of protein. The flavors are also mostly removed in the extract or in drying. The dried concentrate contains about 70% protein unless soybeans containing above-average protein are used.

“This product, having a manufacturing cost between that of soy flour and isolated protein, has been introduced

recently into the food industry. This protein concentrate is a combination of the acid-precipitated protein plus the residue normally obtained in isolating the acid-precipitated protein... A protein concentrate can also be made by extraction of SOM [soybean oil meal] with about 70% ethanol at 50°C or higher. This type of product is finding its place in the food industry.”

Note: This is the earliest English-language document seen (Dec. 2005) that uses the term “protein concentrate 70” or the term “protein concentrate” to refer to a product containing 70% protein on a dry-weight basis. Address: NRRL, Peoria, Illinois.

409. Hayashi, Shizuka. 1961. Soybeans in the nutrition of Japan. *Soybean Digest*. June. p. 31.

• **Summary:** “Japan, with a population of 95 million people on a land area smaller than that of the state of California, is confronted with the problem of how best to feed its population. With the population increasing at a rate of 1 million annually, the problem perhaps will become permanent. According to 1959 government statistics, the following amounts of soybeans (in tonnes or metric tons) were used to produce oil and soyfoods in Japan: Crushed for oil 840,583, tofu 318,150, shoyu (soysauce) 217,686, miso 173,933, frozen tofu 40,000, natto 35,000, kinako [roasted soy flour] 13,000.

Japan uses 420,000 tonnes of soybeans that are grown domestically and 1 million tonnes imported from the U.S. Of the 26.7 gm of fats and oils available to each Japanese daily, 7.6 gm (28%) is supplied by soybeans. Of the 67.7 gm of protein available to each Japanese daily, soybeans provide 10.6 gm (15.7%).

“Meat is not only scarce but the price is too high to meet the daily needs of average people. Annual per capita meat consumption in the United States is 237 pounds while in Japan it is only 2.3 pounds.” “The Japanese intake of fats and oils is less than 10 pounds per capita in comparison with about 50 pounds in western countries.”

“The Japanese live too much on carbohydrate foods. Rice eating must be minimized and more protein foods eaten. The obvious conclusion is the increased consumption of soybeans.”

Note: This is the 2nd earliest document seen (Jan. 2012) that contains industry or market statistics for natto by geographical region. Address: Managing Director, Japanese American Soybean Inst., Nikkatsu International Building., No. 1-chome Yurakucho, Chiyoda-ku, Tokyo, Japan.

410. Spilsbury, Calvin A. 1961. Japan’s oilseed and fats and oils industry. *USDA Foreign Agricultural Service*. FAS M-120. iv + 52 p. Oct. Illust. 28 cm. [9 ref]

• **Summary:** Contents: Introduction. Summary. The fats and oils industry: Total supply of fats and oils, edible fats and oils industries (oilseed crushing and refining industry, rice

bran processing, margarine and shortening, oilseed food industries), industrial fats and oils (the soap industry, paint and protective coating industry). Domestic production of oilseeds and oil-bearing materials: Soybeans (farm income and management, research), rapeseed, other oilseeds, rice bran, marine oils, including whale, animal fats. Foreign trade: Soybeans, other oilseeds, marine oils, animal fats, oilcake and meal, trade controls. Demand and price: Price supports. Consumption. Marketing and market development: Marketing vegetable oils, marketing oilseeds (storage, inspection, soybeans, rapeseed), market development. Bibliography. No names of Asian crushers are given.

Japan's margarine and shortening production in 1960 was 88,600 metric tons, nearly 4½ times that of 1950... Margarine production in 1960 was 43,000 tons. Shortening production was only 41,600 tons in 1960. The margarine and shortening industry in Japan consists of 26 manufacturers, but a large percent of plant capacity is found in only a few plants: 4 plants have one-third of the industry capacity, which is around 400 metric tons per 8-hour day... 67% of the oils used to make margarine and shortening in Japan are animal and marine oils, with whale oil being the most widely used (26% of the total) followed by tallow and lard (21%), then fish oil (20.0%). Palm oils comprise 19.0% of the total and vegetable oils 14.0%.

Concerning oilseed food industries (p. 17-20), in 1960 some 532,218 tonnes (metric tons) of soybeans were used directly as foods or manufactured into foods in Japan. Substantial amounts of peanuts and sesame seeds were also so used. "The Japanese American Soybean Institute in Tokyo is actively promoting U.S. soybeans for food uses and has promoted soybeans as the meat of the field because of the excellence of their amino acids."

Note: This is the earliest document seen (Jan. 2005) containing the phrase "the meat of the field." Notice that it refers to soybeans and was apparently coined by an American organization in Japan.

"More soybeans are used directly for food than are grown in Japan, and the cake and meal from an additional 420,000 tons of soybeans are now used each year. The main soybean foods are: Miso, shoyu, tofu, aburaage (fried tofu), frozen tofu, natto, kinako, monosodium glutamate (extract of fermented soybeans and rice used as a seasoning compound; a low-grade shoyu is a by-product), tonyu (soybean milk, cooked water-extract of soybeans, not widely produced in Japan at the present time).

Miso: There are about 3,200 to 3,800 miso plants in Japan, and a large amount of home-made miso is also produced. "About 117,600 tons of soybeans and 52,300 tons of defatted soybean meal (expeller cake is thought to be the best) are required by this industry. Miso consumption is estimated at 28.9 grams per capita per day." Domestic Japanese soybeans, such as white hilum soybeans from Aomori are preferred to U.S. beans, which cook unevenly

because of their hard seed coats.

Shoyu: There are about 5,000 producers; some have very large plants but many are small. Per capita consumption is about 3 gallons per year. This requires about 18,500 tonnes of soybeans and 155,000 tonnes of defatted soybean meal per year. A small amount of soybean oil (about 1,000 tonnes/year) is skimmed off the top of shoyu and used for a cutting oil. The cake that remains after pressing out the shoyu contains 4% salt, but it is an ideal hog feed as well as a fertilizer. Around 80,000 to 100,000 tonnes a year are produced. A taru (4½ gallons) of shoyu wholesales for about \$3.60. A large volume of soy sauce is now being exported to the USA.

Tofu: There are around 50,000 small tofu plants in Japan. Their demand for soybeans is large and increasing. In 1960 production of tofu and aburaage required 254,800 tonnes of soybeans and 20,000 tonnes of defatted soybean meal. More soybeans and meal are used to make tofu than any other food in Japan, followed by shoyu, then miso. About three-fifths of the soybeans used are imported. In 1960 production of frozen tofu required 27,100 tonnes of soybeans.

In 1960 about 22,800 tonnes of soybeans were required to make natto, 6,200 tonnes to make kinako, 64,800 tonnes of defatted soybean meal were required to make monosodium glutamate, and 10,000 tonnes of soybeans plus 30,000 tonnes of defatted meal were required to make other soybean food products [such as whole soybeans, soybean milk, etc.]. Address: USDA Fats and Oils Div.

411. Akiya, Shichiro; Sawamura, Ryoji. 1961. Nattô-kin no sansei suru nenseita tôshitsu ni kansuru kenkyû. I. Chûshutsu oyobi seisei [Studies on the viscous polysaccharide produced by *Bacillus natto*. I. Extraction and purification]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* 81(11):1583-87. Nov. [17 ref. Jap; eng]

• **Summary:** Natto is made by culturing *Bacillus natto*, a strain of *Bacillus subtilis*, on boiled soy-beans. Natto contains a viscous polysaccharide, which, when hydrolyzed gave three monosaccharides: arabinose, xylose, and galactose. Address: 1. Tokyo Medico-Dental University, Yushima, Bunkyo-ku, Tokyo; 2. Pharmaceutical Inst., College of Science and Engineering, Nihon Univ., Kanda-surugadai, Chiyoda-ku, Tokyo. Both: Japan.

412. Akiya, Shichiro; Sawamura, Ryoji. 1961. Nattô-kin no sansei suru nenseita tôshitsu ni kansuru kenkyû. II. Asechiruka oyobi mechiruka [Studies on the viscous polysaccharide produced by *Bacillus natto*. II. Acetylation and methylation]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* 81(11):1588-92. Nov. [2 ref. Jap; eng]

Address: 1. Tokyo Medico-Dental University, Yushima, Bunkyo-ku, Tokyo; 2. Pharmaceutical Inst., College of Science and Engineering, Nihon Univ., Kanda-surugadai,

Chiyoda-ku, Tokyo. Both: Japan.

413. Sawamura, Ryoji. 1961. Nattô-kin no sansei suru nenseita tôshitsu ni kansuru kenkyû. III. Kayôso-san sanku [Studies on the viscous polysaccharide produced by *Bacillus natto*. III. Periodic oxidation]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* 81(11):1592-95. Nov. [5 ref. Jap; eng]  
Address: Pharmaceutical Inst., College of Science and Engineering, Nihon Univ., Kanda-surugadai, Chiyoda-ku, Tokyo, Japan.

414. Kitasato, T.; Inaba, A.(?); Kato, M. 1961. [Viscous substances of natto. I]. *Scientific Report of the Faculty of Liberal Arts Education, Gifu University* 2:484-85. (Chem. Abst. 68:2001. 1968). [Jap]\*

415. Kudo, Y.; Endo, Y.; Yasufuku, H.; Komatsu, H. 1961. [Changes of vitamin B-1 during natto manufacture]. *Kyoto Joshi Daigaku Shokumotsu Gakkaishi (J. of Food Science, Kyoto Women's University)* No. 10. p. 43-45. [Jap]\*  
Address: Japan.

416. Matsumoto, M. 1961. [On the antibiotic activity of some bacilli. I. Observation on the antibiotic activity of isolated organisms and its bacteriological classification]. *Shimane Noka Daigaku Kenkyu Hokoku. A (Bulletin of the Shimane Agricultural College, A)* No. 9 A-1:145-51. [Jap]\*

417. Matsumoto, M. 1961. [On the antibiotic activity of some bacilli. II. The relation between antibacterial potency and cultural condition concerning to one strain previously isolated]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* No. 9 A-1:152-59. [Jap]\*

418. Matsumoto, M. 1961. [On the antibiotic activity of some bacilli. III. Isolation and identification of the antibiotic of a strain of *B. prausnitzii* T]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* No. 9 A-1:160-63. [Jap]\*

419. Matsumoto, M. 1961. [On the antibiotic activity of some bacilli. IV. Antibiotics of several strains of natto bacteria]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* No. 9 A-1:164-67. [Jap]\*

420. Matsumoto, M. 1961. [On the antibiotic activity of some bacilli. V. Antibiotics of several strains not classified as natto bacteria]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* No. 9 A-1:168-71. [Jap]\*

421. Matsumoto, M.; Iwahara, S. 1961. [On the production of slime substance by natto bacteria. I. Chemical composition of the slime substance]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* No. 9 A-1:172-74. [Jap]\*

422. Matsumoto, M.; Iwahara, S. 1961. [On the production of slime substance by natto bacteria. II. A method for the determination of the slime substance and the effects of cultural conditions on the production of the slime]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* No. 9 A-1:175-78. [Jap]\*

423. Matsumoto, M.; Iwahara, S. 1961. [On the production of slime substance by natto bacteria. III. On the peculiar amino acid production by natto bacteria]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* No. 9 A-1:179-82. [Jap]\*

424. Arimoto, K. 1961. Nutritional research on fermented soybean products. *National Academy of Sciences, National Research Council, Publication* No. 843. p. 269-73. Progress in Meeting Protein Needs of Infants and Preschool Children. [11 ref]

• **Summary:** Powdered natto (made by the method of Sakurai and Nakano 1961) can be added to biscuits, crackers, or soup. The addition of 15% powdered natto in biscuits, 20% in crackers, and 5% in curry soup was acceptable to school children. Address: Director, National Inst. of Nutrition, Toyama-cho, Shinjuku-ku, Tokyo.

425. *National Academy of Sciences, National Research Council, Publication.* 1961. Progress in meeting protein needs of infants and preschool children: Proceedings of an international conference held in Washington, D.C., August 21-24, 1960 under the auspices of The Committee on Protein Malnutrition, Food and Nutrition Board, and The Nutrition Study Section, National Institutes of Health. No. 843. 570 p. Reviewed by Soybean Digest, Nov. 1961, p. 23.

• **Summary:** The National Academy of Sciences was established in 1863, the National Research Council in 1916, and the Food and Nutrition Board in 1940.

In Aug. 1960, 33 researchers from 18 foreign countries joined with 42 researchers from the USA in a 4-day conference to review the results of a worldwide research program for the development of protein products suitable for infants and children from indigenous resources such as soybeans, cottonseed, peanuts, and similar products in countries where protein deficiency is most prevalent. This research program has been conducted by the Committee on Protein Malnutrition with funds provided by the Rockefeller Foundation in cooperation with UNICEF, FAO, and WHO. The researchers also met to survey the areas of greatest need for further research, and to evaluate the status of knowledge

in protein nutrition.

The 45 research reports in this volume constitute a comprehensive summary of the status of protein nutrition around the world and the technological problems involved in the development of economical protein foods. The papers are divided into the following groups: Central and South America (7 papers). Africa and the Middle East (10). India and the Far East (10). Relevant research in the United States (6). Experimental protein malnutrition in animals (4). Basic principles of protein and amino acid evaluation and potential protein resources (10). Protein problems around the world (3). Summary of the conference. Nomenclature guide to plant products cited.

Autret (p. 537) stated "the No. 1 problem for F.A.O. and for national agricultural departments is the production of protein foods of good quality." Address: Washington, DC.

426. Sakurai, Yoshito; Nakano, Masahiro. 1961. Production of high-protein food from fermented soybean products. *National Academy of Sciences, National Research Council, Publication No. 843*. p. 251-55. Progress in Meeting Protein Needs of Infants and Preschool Children. [1 ref]

• **Summary:** A summary of a detailed report prepared for UNICEF. To improve the keeping properties of natto and broaden its potential uses, dry powdered natto was developed. The fermentation time was reduced to 6-8 hours so that the product would be more suitable for general consumption as a food. After fermentation the beans are spread out on metal trays for drying at low temperatures either in vacuum or aeration, until the moisture content is less than 5%; then the beans are milled. Address: 1. Director, Food Research Inst., Ministry of Agriculture & Forestry, 2 Hamazono-cho, Kotoku, Tokyo, Japan; 2. Head, Fermentation Div., Food Research Inst., Fukagawa P.O., Tokyo.

427. Sano, Tamotsu. 1961. Feeding studies with fermented soy products (natto and miso). *National Academy of Sciences, National Research Council, Publication No. 843*. p. 257-68. Progress in Meeting Protein Needs of Infants and Preschool Children. [31 ref]

• **Summary:** The author developed a natto powder, low-salt miso powder, and an autoclaved soybean powder for use in combatting infant malnutrition in underdeveloped countries. Since 1957 Dr György has been studying these soybean foods in collaboration with the author in hopes of increasing their use in infant diets. The natto powder had a higher content of essential amino acids than the soybean powder. Natto powder gave the best results in growth studies on rats, but the increase in body weight was not as great as when the rats were fed skim milk at the same protein level. The miso powder decomposed into a rancid state and thus was unsuccessful.

The vitamin B-12 content of natto was found to be

higher than that of dry soybeans. Address: President, Tohoku Kosai Hospital, 10 Motoyagura-cho, Sendai, Japan.

428. Shufu-no-tomo-sha. 1961. Ryôri hyakka [Encyclopedia of Japanese cookery]. Tokyo: K.K. Shufu-no-tomo-sha. 768 + 20 p. Illust. Index. 21 cm. [Jap]  
Address: Tokyo.

429. Arimoto, K.; Tamura, E.; Matsuno, N.; Obata, Y. 1962. Daizu seihin no eiyô-ka ni kansuru kenkyû. III. Funmatsu nattô no jintai shôka kyûshû shiken [Research on the nutritional value of soyfoods. III. Experiments on the digestion and absorption of powdered natto in the human body]. *Kokuritsu Eiyô Kenkyusho, Kenkyû Hokoku (Research Report of the National Institute of Nutrition)*. p. 46-48. Jan. 10. [Jap]

• **Summary:** Natto was ground into a flour for use as a food or food supplement.

430. Kosuge, Takuo; Kamiya, H.; Adachi, T. 1962. Nattô no nioi no seibun ni tsuite [A odorous component of natto, fermented soy-beans]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* 82(1):190. Jan. [3 ref. Jap]

• **Summary:** In this half-page "Communication to the editor," the authors claim that tetramethylpyrazine formed by the natto bacterium, *Bacillus natto*, is responsible for the unique odor (*nioi*) of natto. Address: 1. Shizuoka College of Pharmacy; 2. Shizuoka Factory of Yakult Co. Both: Shizuoka city, Shizuoka prefecture, Japan.

431. Herb-Mueller, Lene. 1962. Die Soja und Ernaehrungsfragen in Entwicklungslaendern [The soybean and nutrition problems in developing countries]. *Ernaehrungs-Umschau* 9(5):143-46. July. [Ger]

• **Summary:** Nutritive value of soybean products. Address: Bonn.

432. Kosuge, Takuo; Adachi, Tahei; Kamiya, Hiroko. 1962. Isolation of tetramethylpyrazine from culture of *Bacillus natto*, and biosynthetic pathways of tetramethylpyrazine. *Nature (London)* 195(4846):1103. Sept. 15. [3 ref]

• **Summary:** Tetramethylpyrazine has the characteristic smell of natto, or fermented soybeans. Address: Shizuoka College of Pharmacy, Shizuoka, Japan.

433. Fujii, Hisao. 1962. Nattô-kin ni yoru nenshitsu-butsumo no seisei ni kansuru kenkyû. I. Nenshitsu-butsumo seisei jôken no kentô (1) [On the formation of mucilage by *Bacillus natto*. I. Factors affecting the formation of mucilage (1)]. *Nihon Nôgei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 36(12):1000-04. Dec. (Chem. Abst. 62:1114). [10 ref. Jap]

Address: Faculty of Home Life Science, Fukuoka Women's Univ., Fukuoka, Japan.

434. Arimoto, K.; Tamura, -; Kawada, M.; et al. 1962. Daizu seihin no eiyo-ka ni kansuru kenkyū. IV. Funmatsu nattō o mochiita shokuhin no “acceptability test” ni tsuite [Research on the nutritional value of soyfoods. IV. Acceptability tests on 2 or 3 foods contained powdered natto]. *Kokuritsu Eiyo Kenkyusho, Kenkyu Hokoku (Research Report of the National Institute of Nutrition)*. p. 48-49. [Jap]

• **Summary:** Used in a biscuit and a cracker.

435. Arimoto, K.; Tamura, E.; Nishihara, A.; Tamura, A.; Kobatake, Y. 1962. [Nutritional value of soybean products. I. Nutritional value of natto-like products prepared by various processing conditions]. *Kokuritsu Eiyo Kenkyusho, Kenkyu Hokoku (Research Report of the National Institute of Nutrition)*. p. 40-45. [Jap]\*

436. Arimoto, K.; Tamura, E.; Tamura, A.; Kobatake, Y. 1962. [Nutritional value of soybean products. II. Effect of hulling of soybeans and freeze-drying of fermented product on nutritional value of ‘natto’-like product]. *Kokuritsu Eiyo Kenkyusho, Kenkyu Hokoku (Research Report of the National Institute of Nutrition)*. p. 51-53. [Jap]\*

437. Arimoto, K.; Tamura, E.; Kobatake, Y. 1962. [Nutritional value of soybean products. III. Effect of drying methods on the nutritional value of ‘natto’-like product]. *Kokuritsu Eiyo Kenkyusho, Kenkyu Hokoku (Research Report of the National Institute of Nutrition)*. p. 53-54. [Jap]\*

438. Iwabuchi, T.; Suzuki, N. 1962. [Studies on the manufacture of dry provisions by the drying machine at the original temperature. II. Experiments on dehydration of natto]. *Miyagi-ken Nogyo Tanki Daigaku Gakujutsu Hokoku (Scientific Reports of Miyagi Agricultural College)* 10:45-50. \*

439. Kihara, Y. 1962. Sugars and mucilage of natto. In: J.M. Leitch, ed. 1962. Proceedings of the First International Congress, Food Science and Technology. Vol. I: Chemical and Physical Aspects of Food. \*

440. Platt, B.S. 1962. Tables of representative values of foods commonly used in tropical countries. *Privy Council, Medical Research Council, Special Report Series (London, HMSO) No. 302*. v + 46 p. (Revised edition of Special Report No. 253). \*

441. Arimoto, K.; Tamura, E.; Nishihara, A.; Tamura, A.; Kojima, Y. 1962. Daizu seihin no eiyo-ka ni tsuite. II. Shuju no jōken ni oite seizō sareta funmatsu nattō (“Nattō”-like products) no eiyo-ka ni tsuite [Research on the nutritional value of soyfoods. II. Powdered natto produced under various conditions]. *Kokuritsu Eiyo Kenkyusho, Kenkyu*

*Hokoku (Research Report of the National Institute of Nutrition)*. p. 40-45. [Jap]

442. Arimoto, K.; Tamura, E.; Baba, H.; Tamura, A.; Obata, Y. 1962. Daizu seihin no eiyo-ka ni kansuru kenkyū. I. Shihan nattō no eiyo-ka ni tsuite [Research on the nutritional value of soyfoods. I. On the nutritional value of commercial natto]. *Kokuritsu Eiyo Kenkyusho, Kenkyu Hokoku (Research Report of the National Institute of Nutrition)*. p. 36-40. [Jap]

443. Ishiguro, Kōzō. 1963. Studies on pantothenic acid intake. I. Pantothenic acid content in Japanese foods. *Tohoku J. of Experimental Medicine* 78:375-80. Jan. 25 (Chem. Abst. 59:2095). [8 ref]

• **Summary:** Tables show: (1) Pantothenic and 4'-phosphopantothenic acid content in foods (Pantothenic acid {Pa A}) is highest in slimy agaric 0.80 mg/100 gm, moderate in stone leek {white part}, stone leek {green part}, and Japanese radish {"daikon"}). 4'-phosphopantothenic acid is very low in the 10 foods listed.

Note: The “slimy agaric” is probably *Stropharia aeruginosa*, commonly known as the verdigris agaric, a medium-sized green, slimy woodland mushroom.

(2) Free pantothenic acid and total panthetine [pantethine] content in foods. The section of the table titled “Pulses” includes the following two values:

Soybeans, dried 0.86 / 0.08.

Azuki beans, dried 1.35 / 0.03.

Black soy beans, dried 0.76 / 0.24.

Soy bean curd (“Tohu”) 0.10 / 0.02.

“Abura-age” 0.12 / 0.04

“Miso” 0.37 / 0.17.

Fermented soy beans (“Natto”) 1.60 / 0.60.

Peanut 1.80 / 0.20.

Congeaed “Tohu” [perhaps dried frozen tofu] 0.12 / 0.02.

The foods with the highest content of free pantothenic acid in this table are: (1) Rice bran 6.50. (2) Pine agaric, fresh 2.00. (3) Peanut 1.80. (4) Natto 1.60.

The foods with the highest content of total panthetine in this table are: (1) Rice bran 2.20. (2) Fresh kantake mushroom 1.20. (3) Natto 0.60.

Note: Pulses generally contain a substantial amount of free Pa A, but are rather poor in total panthetine; however natto is rich in the latter. Address: Dep. of Hygiene, Tohoku Univ. School of Medicine, Sendai [Japan].

444. Brandemuhl, William. 1963. Soybean history: Aspects of Buddhist influence. Anthropology Dept., University of Wisconsin, Madison. 15 p. Jan. Unpublished manuscript. 28 cm. Summarized as “Early Soybeans Were Spread by Buddhists” in *Soybean Digest*, July 1963, p. 21. [52 ref]

• **Summary:** This research paper (which is not a thesis) was prepared for Anthropology 150a, taught by Dr. R.J. Miller.



Contents: Purpose of study. Method of study. Botanical history: Naming the soybean, the *Glycine ussuriensis* case, other genetic evidence, claim on the origin of the soybean. Initial utilization. Botanical dissemination. Soybean history—non-botanical: Legend, recorded Chinese soybean history, concluding notes on soybean origin and cultivation history. Buddhist influence on the development of the soybean: Soysauce or shōyu, miso, tofu, natto, ancient soybean food products, the soybean grows.

“Another principal concern of this paper is the Buddhist connection to soybean development. The introduction of soybeans, although an approximation at the very best, coincides quite closely with the spread of Buddhism in Japan. As shown later, Buddhism has a very close connection with soybean history and in many product sectors of soybean development, may have created or at least popularized them” (p. 1).

“Contrary to the above statement I submit the following data which I believe can easily be documented: 1. Emperor Sheng-nung is a mythical character (letter from Herbert W. Johnson, Research Agronomist, USDA / ARS Crops Research Div., Beltsville, Maryland, 30 Aug. 1962). 2. Emperor Shen-nung was a legendary character who cannot be pinpointed to a date of 2838 B.C. (letter from Jung-pang Lo, Research Asst. Prof., Far Eastern and Russian Inst., Univ. of Washington, 6 Sept. 1962). 3. Shen-nung is a mythical ruler, never living at the date attributed to him or at any other date (letter from Edward H. Schaefer, Professor of Oriental Languages, Univ. of California, Berkeley, 6 Sept. 1962). 4. A work attributed to Shen-nung is called *Shen nung pen Ts'ao Ching* but since it contains many Han Period facts (around the beginning of the Christian era) it is believed to be a Post-Han work. This work is first mentioned by T'ao Hung-ching (who edited it) early in the 6th century A.D. (Jung-pang Lo). 5-6. The *Pen Ts'ao Kang Mu* was written by L. Shih-chen (1518-1593) in A.D. 1596 or 1597 (Jung-pang Lo, Schaefer)... 9. The word ‘Shiyu’ cannot be found in Chinese dictionaries. The name for the soybean in China being ‘Ta-tou,’ meaning big bean (Jung-pang Lo).”

“Concluding notes on soybean origin and cultivation history: *The Book of Poetry* (Shih-ching) mentions boiling shu (pulse) and the *Erh-ya* (a Chou period lexicon, authorship attributed to Confucius or his disciples) mentions Jung-shu. Kao yu, the commentator, remarked that the Jung-shu (pulse of the Hu people) which was also known as Ta-tou (the soybean). Jung was a term used by the Chinese in the Chou period for the non-Chinese people of the North and Ju was a term used by the Chinese people of the North and West. This would seem to indicate that the soybean was introduced to China from the non-Chinese people of the North. Also supporting this is the *Chou-shu* by Hsi meng, in which there is a reference to Shan-jung shu (pulse of the Jung people of the mountains). A commentator explains that the Shan-jung were tribes in the Northeast (Manchuria).

“The Kuang-Tzu contains a passage saying that after Duke Huan of Chi (7 B.C.) defeated the Shan-jung the Jung-shu came to be known throughout China. Chia su-hsieh (5 A.D.) in his book *Ch'i-min Yao-shu* (Ts'tung-shu Chi-ch'eng, editor) quoted the *Shen-nung pen Ts'ao* as saying that Ta-tou (the big bean) was the Hu-Tou (Hu peoples' bean) which Chang Ch'ien brought back from his exploration of central Asia in the first century B.C., there being two varieties. In the Han period both Ts'ui shih and Fansheng in their books on farming techniques mention cultivation of the Ta-tou and its use in famine relief. The *Pen Ts'ao Kang Mu* (1596), mentioned earlier, has a long discourse on the medical properties of the Ta-tou (Jung-pang Lo).”

“Buddhist influence on the development of the soybean: Although references to the Buddhist influence on soybean development are particularly sparse I believe Buddhism deserves credit for initiating the spectacular expansion of soybean utilization in Japan which triggered utilization in the rest of the world. The Buddhist connection is certainly true if oil utilization is excluded. Below lie the reasons for my belief.

“Buddhism was introduced into Japan around 500-600 A.D. (Bush 1959, p. 28-29). Among the priests the traditional hate of flesh was present and agriculture of the field type was encouraged by the government (Tezuka 1936, p. 13). The introduction of soybeans fits well into this historical development. The recent finding of soybean seed in *Shōso In* (Japan) which was established in the Nara era for the storing of legumes of that era that were introduced from China (Nagata 1960, p. 97) proves as does the record of ceremony and taxation system of the Nara era (Nagata, p. 75) that soybeans did exist in Japan at that time.

“Soysauce or more properly shōyu, the now renowned Japanese flavoring, is said to have originated during the Chou dynasty (1134-246 B.C.) (Komiya 1955, p. 14) and was introduced into Japan when Buddhism was being established although not becoming popular until 1300 (Joya 1951, p. 31-33).

“Miso, soybean paste, is a much used breakfast and soup dish in Japan that was introduced to Japan from China or Korea (Horvath 1927, p. 83). It was definitely used by the priests when they first entered Japan, in fact they popularized it among their new vegetarian converts (Joya, p. 21-23).

“An ancient Chinese book states that the Philosopher Hamintze, a prince of the Han dynasty, was the inventor of Tofu or soybean curd (Horvath, p. 6) while another source attributes the tofu innovation to the Chinese Philosopher Whai Nain Tze (Piper & Morse 1923, p. 234). The manufacture of soybean curd (tofu) was started in China in 164 B.C. during Emperor Hwai Wen's reign by Liu An, duke of Hwai Nan. Liu An was a great friend of the Buddhist monks and it seems quite likely that he made this bean curd to provide a change or delicacy to break the monotony of the monastic ration.” Note: Whai Nain = Huainan. Liu An was

the duke (*tze*) of Huainan. So all of these people are one and the same person.

“Tofu was introduced into Japan from Korea for the first time during the Toyotomi government (Horvath, p. 73) and was undoubtedly introduced into Japan from China by the Buddhists (Piper & Morse, p. 234) being used for their daily food before it was generally used (Horvath, p. 73).

“The true Buddhist monk was carried through the period of childhood growth on a rather heavy diet of bean curd (Horvath, p. 17). Even the naming of soybean curd has its esoteric connotations as the Classical Chinese name for tofu is *Li chi* which probably means morning prayer (Horvath, p. 72).

“Natto, a sort of vegetable cheese prepared from soybeans has long been used by the Buddhists and is now used extensively by the Japanese (Piper & Morse, p. 224).

“Buddhism seems to have been a major reason for the development of Japan for main soybean products. With the existence of these products Japan opened the world to soybeans.” Address: Univ. of Wisconsin, Madison, Wisconsin.

445. McEachern, Margaret. 1963. Symphony of sounds tells time in Tokyo: Centuries-old street calls. *Christian Science Monitor*. May 25. p. 15.

• **Summary:** Tokyo—The Japanese housewife doesn’t need a clock to tell the time of day. She only needs to listen to the distinctive calls from her street.

“The day begins with the call, ‘Natto... natto...’ in a high youthful voice.” That is the sound of a teen-age boy making his rounds as he sells his fermented [soy] beans—a little delicacy that is tasty and nourishing. Japanese housewives use natto in soup, seasoned with soy sauce, served over rice.

The Japanese may be the only people who enjoy soup in the morning. This soup, called *misoshiru*, “consists of ‘miso,’ or fermented bean soup [sic, fermented soybean paste] with vegetables and fish.”

In the late afternoon one hears the eerie sound of the [soy] bean-curd seller. He carries his produce in wooden buckets attached to both ends of a long bamboo pole.

Note: The writer is apparently unaware that natto, miso, and tofu are each made of soybeans—for that word does not appear in the article. A photo shows a housewife shopping in Tokyo.

446. Fujii, Hisao. 1963. Nattô-kin ni yoru nenshitsu-butsumo no seisei ni kansuru kenkyû. II. Nenshitsu-butsumo seisei jôken no kentô (2) [On the formation of mucilage by *Bacillus natto*. II. Factors affecting the formation of mucilage (2)]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 37(6):346-50. June (Chem. Abst. 63:3338). [9 ref. Jap]

Address: Faculty of Home Life Science, Fukuoka Women’s Univ., Fukuoka, Japan.

447. Fujii, Hisao. 1963. Nattô-kin ni yoru nenshitsu-butsumo no seisei ni kansuru kenkyû. III. Itohiki nattô no nenshitsu-butsumo ni tsuite (1) [On the formation of mucilage by *Bacillus natto*. III. Chemical constituents of mucilage in natto (1)]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 37(7):407-11. July (Chem. Abst. 63:3338). [22 ref. Jap]

Address: Faculty of Home Life Science, Fukuoka Women’s Univ., Fukuoka, Japan.

448. Smith, Allan K. 1963. Foreign uses of soybean protein foods. *Cereal Science Today* 8(6):196, 198, 200, 210. July. [28 ref]

• **Summary:** Contents: Introduction (world food shortages). Technological assistance (by NRRL). Oriental traditional foods: Tofu, shoyu or soy sauce, miso or soy paste, monosodium glutamate, natto and kinako, soy beverage, tempeh (tempe). Recent food developments. Address: NRRL, Peoria, Illinois.

449. Fujii, Hisao. 1963. Nattô-kin ni yoru nenshitsu-butsumo no seisei ni kansuru kenkyû. IV. Itohiki nattô no nenshitsu-butsumo ni tsuite (2) [On the formation of mucilage by *Bacillus natto*. IV. Chemical constituents of mucilage in natto (2)]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 37(8):474-77. Aug. (Chem. Abst. 63:3339). [11 ref. Jap]

Address: Faculty of Home Life Science, Fukuoka Women’s Univ., Fukuoka, Japan.

450. Aoki, Hatsuo; Saito, Huiga; Ikeda, Yonosuke. 1963. Transduction and transformation between *Bacillus subtilis* and *Bacillus natto*. *J. of General and Applied Microbiology (Tokyo)* 9(3):305-11. Sept. [9 ref]

• **Summary:** Seven strains of *Bacillus natto* were all found to be vulnerable to phage S-1, while five among them were able to transfer their genetic traits to *Bacillus subtilis* by the phage. Address: Inst. of Applied Microbiology, Univ. of Tokyo, Bunkyo-ku, Tokyo, Japan.

451. Fujii, Hisao. 1963. Nattôkin ni yoru nenshitsu-butsumo no seisei ni kansuru kenkyû. V. Nenshitsu-butsumo seisei ni oyobosu baiyô jôken no eikyô [On the formation of mucilage by *Bacillus natto*. V. Effects of some cultural conditions on the chemical constituents of mucilage]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 37(10):615-18. Oct. (Chem. Abst. 63:12021). [10 ref. Jap]

Address: Faculty of Home Life Science, Fukuoka Women’s Univ., Fukuoka, Japan.

452. Fujii, Hisao. 1963. Nattô-kin ni yoru nenshitsu-butsumo no seisei ni kansuru kenkyû. VI. Nenshitsu-butsumo seisei no

kisa ni tsuite (1) [On the formation of mucilage by *Bacillus natto*. VI. The mechanism of mucilage formation (1)]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 37(10):619-22. Oct. (Chem. Abst. 63:12021). [14 ref. Jap]

Address: Faculty of Home Life Science, Fukuoka Women's Univ., Fukuoka, Japan.

453. Muto, Shizuko; Takahashi, E.; Hara, M.; Konuma, Y. 1963. Soybean products as protein sources for weanling infants. *J. of the American Dietetic Association* 43(5):451-56. Nov. [12 ref]

• **Summary:** In Japan, the main protein sources for the weanling infant, in the form of solid food, "are *tofu* (soybean curd), *natto* (fermented soybean), and *kinako* (toasted soybean flour)."

Describes briefly how each is made commercially. For example, for *kinako*, the soybeans are dry heated in an oven for about 25 minutes. The temperature inside the beans at the time they are removed from the oven is about 105°C. They are then milled into flour [probably after being allowed to cool to room temperature] and sieved through a 70-mesh screen. "The product has a pleasant odor, similar to fresh-toasted bread, and is brownish yellow in color. It is mixed with sugar and is used as a coating for rice cakes."

Nitrogen balance studies on infants fed these foods showed that they "can be substituted at least in part for animal foods in the solid diet of weanling infants with no appreciable drawbacks on growth, digestibility, and nitrogen retention."

Note: The researchers seem to assume that animal-based protein sources are nutritionally superior to plant-based sources. Address: Aiiku Research Inst. of the Mother and Child, Tokyo.

454. Standal, Bluebell R. 1963. Nutritional value of proteins of Oriental soybean foods. *J. of Nutrition* 81(3):279-85. Nov. [18 ref]

• **Summary:** Hawaii imports 680-907 metric tons/year of soybeans from the United States mainland and most of it is used for food. "Oriental soybean products are used daily by all nationalities in Hawaii. They constitute important items in the diet. All soybean products used in these islands, e.g., *tofu*, *natto*, *miso*, *shoyu*, and sprouts, are prepared from the matured beans by the methods used in Japan and China. A certain amount of the beans is grown locally and picked green for use as will be described later" (p. 279).

The commercial process for making each product is described. Concerning *natto*: "The preparation had a characteristic cheesy odor which attracted flies and apparently stimulated the appetite of rats. Agar smears of the preparation show that it contained an almost pure culture of gram-positive rods in long chains, without spore formation for 2 days at 31°C. Three brands of *natto* were available."

The Net Protein Utilization (NPU) values, at 10% protein in the diet for rats, were determined to be: powdered whole egg (control) 90.4, *edamame* (green soybeans; "picked green and used as a vegetable") 72.2 (the highest of any soyfood in this study), *tofu* 65.0, [soy] bean sprouts 56.0, *natto* 44.4, and mung bean sprouts (*Phaseolus aureus* Roxb.) 35.6. Address: Dep. of Nutrition, Hawaii Agric. Exp. Station, Univ. of Hawaii, Honolulu.

455. Yanagihara, Toshiko; Komoda, Hayashi; Yoneyama, Hitoshi.; Yamada, Masakazu. 1963. [So-called oriental flavour of various foods]. *Shokuhin Eiseigaku Zasshi (J. of the Food Hygienic Society of Japan)* 4(6):348-53. Dec. (Chem. Abst. 60:13787). [3 ref. Jap; eng]

• **Summary:** The various foods include fish-soy, "kusayano-himono" (some dried fish), and *natto* (viscid steamed soybeans fermented with *Bacillus natto*). The so-called oriental flavor was shown to consist mainly of the mixture of acetic acid and *iso-valeric* acid. The latter acid may perhaps be derived from leucine formed as a oxidatively decomposed product of protein. Address: Dep. of Fermentation, Tokyo Univ. of Agriculture, Setagaya-4, Setagaya-ku, Tokyo.

456. Yuwa, J.A. 1963-1964. Introduction of soyabeans into Abuja [Emirate, south central Nigeria]. *Samaru Agricultural Newsletter* 5:100-101. [Eng]

• **Summary:** Contents: Abuja Emirate. Introduction of soyabeans. Production of soyabeans 1950-1962. Extension activities on soyabeans: To improve the quality of exportable seed, to increase yield per acre, to increase the acreage of soyabeans grown in the Division. Other uses of soyabeans.

Abuja Emirate forms the southeastern corner of Niger Province in Nigeria. It has a total population of over 71,739 people, occupying an area of about 2,337 miles. In 1941, during World War II, Nigeria's Ministry of Agriculture introduced soyabeans as an additional cash crop in an attempt to improve local living standards. 4 tons of Malayan seeds were introduced and distributed among all the adult taxpayers for planting. Farmers generally showed little interest in growing soyabeans until 1950, when the Ministry of Agriculture renewed its campaign for soyabean planting and introduced another 4 tons of Malayan seed. Production increased from only 8 tons (26 acres) in 1950/51, to a record 561 tons in 1961/62. The crop is grown mostly in the northern part of the Division. Abuja Town produces by far the largest amount, followed by Kabo, Gwagwa, and Diko. Starting in 1963/64 all soyabeans in the Division were sold to the newly-formed Abuja Cooperative Society.

Concerning uses: "The Gwarrin Genge around Diko have discovered that soyabeans can be used for making 'Daddawa' in place of the usual locust bean. The Koros around Ija pound it into powder and use it in place of melon seed to thicken their soup."

Note 1. This is the earliest English-language document

seen (Jan. 2012) that contains the word “Daddawa” in connection with soybeans, or states that soybeans are being used to make “Daddawa” in Africa. Soybean daddawa [dawadawa] is a close relative of natto.

Note 2. This is one of several periodicals published by the Institute for Agricultural Research (IAR), a semi-autonomous institute within the Ahmadu Bello University at Samaru, near Zaria, Nigeria. Before the establishment of the University in October 1962, Samaru was the headquarters of the Research and Special Services Division of the Ministry of Agriculture, Northern Nigeria. As of 1968, IAR had outstations at Shika, Kano, and Mokwa. Address: Abuja, Nigeria.

457. Choe, C.E.; Lee, S.K.; et al. 1963. Vitamin B-12 contents in fermented soybeans inoculated with *Bacillus megaterium*. *Kisul Yon-guso Pogo, Seoul, Korea* 2:22-23. \*

458. Matsumoto, M.; Iwahara, S.; Abe, S. 1963. [On the polynucleotides in the cell of natto-bacteria]. *Shimane Noka Daigaku Kenkyu Hokoku (Bulletin of the Faculty of Agriculture, Shimane University)* 11:50-53. [Jap]\*

459. Chaves, Nelson. 1963. Proteínas vegetais e trópicos [Vegetarian and tropical proteins]. Recife, Brazil: Imprensa Universitária. 151 + 5 p. Illust. Series: Coleção nordestina, 2. [75+\* ref. Por]

• **Summary:** Soyfoods and their nutritional value are discussed on pages 65-67, incl. soymilk (*leite de soja*), tempeh, miso, tofu, shoyu, and natto.

Note: This is the earliest Portuguese-language document seen (Sept. 2011) that mentions tempeh, which it calls “tempeh.” Address: Universidade do Recife, Instituto de Fisiologia e Nutricao.

460. Tanaka, Heihachi; Nicholas, Betty. 1963. The pleasures of Japanese cooking. Englewood Cliffs, New Jersey: Prentice Hall, Inc. viii + 247 p. Illust. Index. 22 cm.

• **Summary:** Contents: Introduction. 1. A chat about Japanese food: Seasonings and flavorings, table settings and utensils, kitchen utensils, etiquette, cooking and serving a Japanese meal. 2. Appetizers. 3. Soups. 4. Broiled dishes. 5. Steamed dishes. 6. Saucepan foods. 7. Fried foods. 8. Salads. 9. Vegetables. 10. Rice and noodle dishes. 11. Thirst-quenchers. 12. Desserts. 13. Festival foods. Glossary [of Japanese foods and utensils]. List of retail outlets for Japanese food products (national chains and alphabetically by state in the USA).

The book begins (p. 1): “To many Westerners, the cuisine of Japan consists almost entirely of *sukiyaki*, *tempura*, rice and soy sauce. Nothing could be further from the truth.”

Vegetables “are harvested at the height of their season,” when tender and full of flavor, then cooked lightly and used (for example) “as an ingredient in *misoshiru* (thick soup

[miso soup]) or pickled” (p. 3).

“If one were to single out the most important vegetable cultivated in Japan it would be the soybean. For this legume,... is such a versatile food that it is served in some manner at practically every Japanese meal.

“In the hilly interior of the country where fish is scarce, or in the vegetarian menus of the Buddhists, soybeans are called the ‘fish of the field’ and relied upon as a valuable source of protein. A favored way of preparing the green soybean is simply to boil and hull it. Dried soybeans are ground [sic], soaked in water, cooked and mashed, sieved through silk, and finally cooked again to produce bean curd or *tofu*.

“Steamed and fermented beans become *natto*. *Miso*, a bean paste made by boiling soybeans, mashing them, adding wheat ferment [sic] and salt and allowing this mixture to ferment for several months, lends itself to use in countless dishes. *Moyashi*, the tender young sprouts of the soybean, are cultivated on indoor racks to conserve precious space in the fields.” In a few days, a single cup of soybeans will produce 3-4 pounds of succulent sprouts (p. 3-4).

“Queen of Japanese seasonings is *shoyu* or soy sauce, a dark, red-brown, thirst-provoking liquid made from wheat or barley, soybeans, salt and water. *Shoyu* is loved by the Japanese for its piquant flavor and its use is so extensive that almost no dish is conceivable without it.” A brief history of *shoyu* and its forerunner, *hishio*, and the process for making *shoyu* are given. *Shoyu* “mash is allowed to ferment and mature naturally for a full eighteen months when it is pressed and the sauce obtained pasteurized to become refined *shoyu*.

“Another multi-purpose seasoning and foodstuff is *miso*, a paste made from fermented rice and soybeans.” Most *miso* “lasts for years without spoiling or deteriorating. There are two types of *miso*—red and white. Both are widely used in Japan but western palates seem to prefer the white type. Both are highly nutritious and are used in literally hundreds of ways: as a seasoning, a main dish and the basis of many hearty, potage-type soups” (p. 5-6).

“For centuries [sic] Japanese cooks have used a dashi of *aji-no-moto*, a seaweed or vegetable protein derivative, to intensify the natural flavors of the foods they cooked. Translated, *aji-no-moto* means ‘essence of taste’ (it is often referred to as taste powder) because the minute white crystals heighten the inherent flavors of foods,... but lending no flavor of their own” (p. 6).

Yakimono are broiled foods. “Flavor broiling includes *yakitori* (broiled chicken), *teriyaki* (fish marinated in a sauce containing *shoyu* and then broiled),... Miso-broiling is used for such vegetables as eggplant as well as for fish or meat” (p. 13).

“Inasmuch as *shoyu*, or soy sauce, is such an all-important seasoning and is called for in almost every Japanese recipe, it should be noted that the use of genuine *shoyu* is quite essential. Most other soy sauces, while

excellent for other types of cuisine, really don't do justice to Japanese cooking" (p. 19). Also discusses wasabi, sesame seeds, sesame oil, katsuobushi, konbu, sake, and various mushrooms (p. 20-22).

"Tofu, or soybean curd, is such a versatile foodstuff—it may be boiled, fried, steamed, sautéed or marinated—that it is included as an ingredient in many recipes in this cookbook. Fresh *tofu* is sold in cakes; refrigerated, it will keep about one week. It is also available in cans and, while the processed product is not quite as tender as the fresh, it does make a satisfactory substitute. The consistence of *tofu* resembles thick custard and it should be handled carefully to avoid breaking and crumbling. Western taste buds seem to find *tofu* bland and a bit flavorless, but when deftly sauced it is very delicious—and also nutritious. Note: *tofu* must not be overcooked or it will toughen and develop a rubbery texture" (p. 24).

Recipes include: Norimaki-Sushi (with nori, shoyu, and sashimi). Tiny teriyaki (ingredients: 2 pounds beef tenderloin, 1 cup shoyu, 3/4 cup water, 1/2 cup mirin, 3/4 cup honey, 1 clove garlic, crushed, and 1 one-inch piece fresh gingerroot, grated; p. 46). Liver tsukudani (with shoyu; p. 55). Fish and tofu stew (p. 69). Oyster miso (p. 71). Vegetable and noodle miso (p. 72). Shrimp or prawn miso (p. 73).

Chapter 4 is titled "Broiled foods." "... almost all cooking in Japan is done over a charcoal fire,..." "Without a doubt, the most popular of all broiled dishes with the Japanese people is *yakitori*, or broiled chicken... Almost as popular as *yakitori* is *teriyaki*, usually fish marinated in a *shoyu* sauce, arranged on long skewers, and then broiled over charcoal. *Teriyaki* means 'glaze broiled'—*teri* meaning 'shiny' and *yaki* 'broiled' or 'roasted.' Actually any meat may be *teriyaki*," but all have in common "the marinade of shoyu, sake, and sugar" (p. 75-76). Recipes include: Salmon teriyaki. Shrimp teriyaki. Stuffed beef teriyaki (p. 88-90). Shoyu marinade basting sauce (p. 93). Sukiyaki (with tofu and shoyu; p. 110). Tempura sauce (with shoyu, p. 121). Fried tofu with sauce (p. 127). Pickled seaweed (with konbu and shoyu, p. 140). Sesame-shoyu dressing (p. 151). Vegetables with tofu sauce (p. 154). Cabbage with mustard-miso sauce (p. 157). Eggplant with miso sauce (p. 164). Azuki meshi (red beans and rice; p. 181). Domburi soboro (with tofu; p. 182-83). "Red bean paste (sweetened)." Ingredients: "2 cups red beans (azuki). 2 cups sugar. 2 teaspoons salt." (p. 203.) Also called "sweetened red bean paste" (p. 200; Jap. *azuki an*; p. 200-203). Yokan (with "1 1/2 cups strained red bean paste"—*koshi-an*; p. 204). Hikishamanju (Bean jam buns with strained red bean paste; p. 207). Shiruko (Red bean soup [azuki] with rice cakes {mochi}; p. 209). Zoni (Rice cake soup, with mochi; p. 215-16). Sweetened soybeans (for New Year's, p. 217-18).

The glossary includes *abura-age*, *azuki* ("red beans"), *azuki-an* ("red bean paste"), *daizu* (soybean), *ganmodoki*,

*kanten*, *konbu*, *konnyaku*, *miso* (aka *miso*, *shiro miso*), *misoshiru*, *mochi*, *mochigome*, *mochiko*, *nori*, *shiru-miso*, *shoyu*, *teriyaki*, *tofu*, *wakame*, *yakidofu*.

Note: This is the earliest English-language document seen (March 2006) that uses the term "sweetened red bean paste" to refer to sweet azuki bean paste [*azuki-an*] or that uses the term "strained red bean paste" to refer to strained azuki bean paste [*koshi-an*]. Address: 1. Head Chef, Japanese Cuisine, Japan Airlines.

461. Ohta, Teruo; Ebine, H.; Nakano, M. 1964. Tenpe (tempeh) ni kansuru kenkyū. I. Indonesia-san tenpe funmatsu no hinshitsu to seijō ni tsuite [Study on tempeh. I. On the property of tempeh powder made in Indonesia]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 18. p. 67-69. March. [4 ref. Jap; eng]

• **Summary:** Soybeans were fermented with *Rhizopus oryzae* for 60 hours at 30°C, then vacuum dried and ground to a powder. The solubility of protein and the rate of amino-nitrogen to total-nitrogen were 20% and 2% respectively, indicating that protein hydrolysis slightly exceeded that of koji-beans, but was far less than that of natto.

Peroxide value of fat and oil in tempeh stored for 3 months at room temperature was only 1.3 M.E./kg, whereas that of cooked and dried soybean powder and that of natto powder stored under the same conditions were 71 M.E./kg and 38 M.E./kg respectively. This fact shows that tempeh has antioxidative property comparable to that of miso. Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

462. Ohta, Teruo; Ebine, Hideo; Nakano, Masahiro; Hieda, Harukyo; Sasaki, Hirokuni. 1964. Nattō-kin o riyō suru daizu hakkō shokuhin ni kansuru kenkyū. I. Seizō jōken ni kansuru kisoteki kenkyū [Manufacturing new-type fermented soybean food product employing *Bacillus natto*. I. Investigation of the production on a laboratory scale]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 18. p. 46-52. March. [9 ref. Jap; eng]

• **Summary:** A description of the process and an indication of its acceptability. Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

463. Ohta, Teruo; Ebine, H.; Nakano, M.; Hieda, H.; Sasaki, H. 1964. Nattō-kin o riyō suru daizu hakkō shokuhin ni kansuru kenkyū. II. Chūkan seizō shiken to niji kakōhin no shikō chōsa [Manufacturing new-type fermented soybean food product employing *Bacillus natto*. II. Manufacturing at a pilot plant and investigation of the acceptability of second generation products]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 18. p. 53-59. March. [2 ref. Jap; eng]

Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

464. Adachi, Tahei; Kamiya, H.; Kosuge, Takuo. 1964. Kosôkin no taishasan-butsumi ni tsuite. II. Bacillus natto ni yoru tetramethylpyrazine no seisei [Studies on the metabolic products of *Bacillus subtilis*. II. The production of tetramethylpyrazine by natto]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* 84(5):451-52. May. [2 ref. Jap; eng]

• **Summary:** Tetramethylpyrazine was isolated and identified. "This compound was assumed to be responsible for the odor of natto." Address: 1. Shizuoka Factory of Yakult Co.; 2. Shizuoka College of Pharmacy. Both: Shizuoka city, Shizuoka prefecture, Japan.

465. Kamiya, Hiroko; Adachi, T.; Kosuge, T. 1964. Kosôkin no taishasan-butsumi ni tsuite. I. Tetramethylpyrazine no buri oyobi kakunin [Studies on the metabolic products of *Bacillus subtilis*. I. Isolation and identification of tetramethylpyrazine]. *Yakugaku Zasshi (J. of the Pharmaceutical Society of Japan)* 84(5):448-51. May. [4 ref. Jap; eng]

Address: 1, 3. Shizuoka College of Pharmacy; 2. Shizuoka Factory of Yakult Co. Both: Shizuoka city, Shizuoka prefecture, Japan.

466. Kihara, Yoshijiro; Nanba, Rimiko. 1964. Nattô no seibun ni tsuite. II. Nattô no origosakkaraido ni tsuite [Chemical constituents of natto. II. Oligosaccharides in natto]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 38(5):257-61. May. (Chem. Abst. 62:14983). [16 ref. Jap]

Address: Lab. of Food Chemistry, Faculty of Home Economics, Ochanomizu Univ., Tokyo, Japan.

467. Platt, B.S. 1964. Biological ennoblement: Improvement of the nutritive value of foods and dietary regimens by biological agencies. *Food Technology* 18(5):68-73, 75-76. May. [34 ref]

• **Summary:** The most common vitamin deficiency worldwide is probably riboflavin (B-2). The amount of riboflavin is increased in the preparation of various fermented foods. Riboflavin is synthesized by a wide variety of microorganisms, notably by a yeastlike organism, *Eremothecium ashbyii*, which has been grown with a high yield on wheat bran and on the refuse (*tou cha* [okara]) from the manufacture of soy bean curd (tofu).

"Riboflavin is also increased in the fermentation of a variety of seeds, notably the seed of the African locust bean (*Parkia filicoidea*)." Boil the seeds for 24 hours to soften the seed coats, then remove the coats. Boil the kernels again for about 2 hours, then set them aside, cover with leaves, and allow to ferment for 2-3 days. Pound the fermented mass into a paste, form it into small balls, then dry these in the sun. The resulting product, "which is found widely throughout

West Africa, is known as *dawadawa* or *uri*, keeps well if properly dried, and may contain 0.2 to 0.8 mg riboflavin and 37% of protein" (Platt, 1962).

Note: No mention is made of soybeans being used to make dawadawa. Address: Prof. of Human Nutrition, London School of Hygiene & Tropical Medicine, London, W.C. 1, England.

468. Norin Suisan-sho, Nosan Engei Kyoku, Hatasaku Shinko-ka. 1964. Daizu ni kansuru shiryô [Statistics concerning soybeans]. Tokyo, Japan. 26 cm. [Jap]

• **Summary:** This yearly report, published by Japan's Ministry of Agriculture, Forestry, and Fisheries (MAFF), is packed with detailed statistics on soybean production, trade, and utilization in Japan. Address: Tokyo, Japan.

469. Kobatake, Yoshiki; Matsuno, N.; Tamura, E. 1964. Daizu kakô shokuhin no tanpakushitsu no eiyô-ka [Nutritional value of protein in Japanese soybean products]. *Eiyogaku Zasshi (Japanese J. of Nutrition)* 22(5):173-77. Sept. [7 ref. Jap]

• **Summary:** The Biological Value of tofu was 68.5, and dried-frozen tofu (kori-dofu) was 69.1. Both values indicate high nutritional quality. Even higher protein quality was observed in okara, a by-product of tofu. Its Biological Value was 84.9, though its absorption rate was 78.4%. The value for casein was 80.1, for salt-free miso 73.2, for low-salt miso 70.7, and for freeze-dried low-salt miso 60.5. Address: Division of Biochemistry of Nutrition, National Institute of Nutrition.

470. Kitasato, T.; Ojio, S.; Tanaka, T. 1964-1965. [Viscous substances of natto. II. Purification of viscous substances]. *Scientific Report of the Faculty of Liberal Arts Education, Gifu University (Natural Science)* 3:263-65. (Chem. Abst. 68:2002. 1968). [Jap]\*

471. **Product Name:** Hinode Natto.

**Manufacturer's Name:** Hinode Tofu Company.

**Manufacturer's Address:** 526 Stanford Ave., Los Angeles, CA 90013.

**Date of Introduction:** 1964.

**New Product-Documentation:** Interview with Mr. Shoan Yamauchi. 1982. June 29. He started making natto in 1964 and now makes 5,000 packages a week.

Pantry Supermarkets. 1983. "Double coupons!" (Ad). *Los Angeles Times*. Feb. 24. p. SG3. The section titled "Oriental foods" states: "Hinode natto (steamed soybeans) 5 oz.-49¢."

472. Ozawa, K. 1964. [Studies on *Bacillus natto*. Comparative research of newly isolated or preserved *B. natto* or *B. subtilis*]. *Meguro Kenkyusho Hokoku* 7:1-8. [Jap]\*

473. Sakurai, K. 1964. The role and significance of soy bean foods in Japan. University of Tokyo. Unpublished manuscript. \*  
Address: Tokyo, Japan.

474. Shibamoto, G. 1964. [Experimental studies on the nutritive effect of natto. I]. *Tokyo Ika Daigaku Zasshi (J. of Tokyo Medical College)* 22:337-38. [Jap]\*

475. Shibamoto, G. 1964. [Experimental studies on the nutritive effect of natto. II]. *Tokyo Ika Daigaku Zasshi (J. of Tokyo Medical College)* 22:449. [Jap]\*

476. Tsuno, S.; Matsumoto, M. 1964. [Studies on the nutritional value of Natto Prorich I]. *Kobe Daigaku Kyoikugaku-bu Kenkyu Shuroku (Bulletin of the Faculty of Education, Kobe University)* 31:129. [Jap]\*

477. Arima, K. 1964. Microbial enzyme production. In: M.P. Starr, ed. 1964. *Global Impacts of Applied Microbiology*. New York: Wiley. 572 p. See p. 277-94. Held 29 July to 3 Aug. 1963 at Stockholm, Sweden.

• **Summary:** Table 1 (p. 278-79) shows industrially produced enzymes and their applications. Among the 34 enzymes are diastase (from malt), Takadiastase (from *Aspergillus oryzae*), amylase (from *B. subtilis*, [the natto bacterium]), rennet (from calf stomach), papain (from papaya), Takamine Pectinase Clarase (made by Takamine Lab.), penicillinase (from *B. subtilis*, made by Takamine Lab.), glucose oxidase (from *Aspergillus niger*, made by Takamine Lab.), adenylic acid (in Takadiastase).

Page 280 discusses “Takadiastase—This enzyme is produced by *Aspergillus oryzae* and is sold as a digestive aid. It is the oldest enzymatic product in use, but is still sold throughout the world. It is manufactured by the conventional tray culture method.”

Page 282 discusses microbial rennet: “Rennet is the enzyme which develops in the fourth stomach of young calves while they are milk-fed. Later, when they are switched to other feed, the enzyme disappears.” In recent years a shortage of animal rennet for cheesemaking has developed, so many investigators have searched for substitutes among vegetable and microbial enzymes. Arima and Iwasaki began this line of research several years ago and succeeded in isolating soil microorganisms that produced rennet. Their microbial rennet enzyme has been tested for making cheese, both in the USA and in Japan, and has proven satisfactory with respect to coagulation activity, flavor, and texture of the cheese.

Pages 283-89 discuss commercial enzyme production. The two basic methods are liquid culture (surface, or submerged) and solid culture (five types of Koji methods: Conventional koji tray culture, mechanized koji tray culture, rotary drum culture (not very successful), koji tray culture

with aeration of controlled temperature and humidity, and thick layer koji culture). Address: Dep. of Agricultural Chemistry, Univ. of Tokyo, Bunkyo-Ku, Japan.

478. Aykroyd, Wallace R.; Doughty, Joyce. 1964. Legumes in human nutrition. *FAO Nutritional Studies* No. 19. xi + 138 p. Reissued by FAO in 1982 (152 p.). [119 ref]

• **Summary:** Contents: Preface. Introduction. History of legumes. Production and consumption. Composition and nutritive value. Methods of processing and cooking: Soybean preparations in East Asia (p. 48-52)—Germination (sprouted soybeans), soybean curd (tofu, incl. *chou tofu* or “stinking soybean curd”), soy sauce (shoyu), soybean paste (miso), tempeh, natto, hamanatto, soybean “milk,” fermented preparations from groundnuts. Groundnut flour.

Effects of processing on nutritive value: Soaking, decortication, heating, germination, fermentation (mentions tempeh), effects of storage.

Toxic substances. Legume proteins. Observations on the value of legumes in human feeding. The place of legumes in human diets. Appendixes: (1) Legumes eaten by man. (2) Nutritive value of important legumes. (3) Amino acid content of legumes. (4) Account of lathyrism in central India by General Sleeman. (5) Bibliography of soybean (11 references). Some legume recipes. References.

Soybeans are also mentioned on pages 15 (Table 1, “Important legumes”), 23 (Indonesia, soybean curd, soy sauce, tempeh), 23-24 (Japan, miso, shoyu, natto, tofu, Korea, Taiwan), 39-40 (carbohydrates in soybeans include “galactans, pentoses, and hemicelluloses which are poorly utilized.”) Fats: only the groundnut and soybean are important sources of it), 55 (heating and trypsin inhibitor, methionine and cystine, raw unheated soybean meal, saridele), 58 (fermentation, tempeh, PER), 75-76 (protein values), 81 (Dean used soybeans to treat a protein deficiency), 84 (soybeans in India), 97 (soybean curd).

Appendix 1, titled “Legumes eaten by man” (p. 101-14), lists the various legumes by their Latin names. The entry for *Psophocarpus tetragonolobus* gives its vernacular names as “Goa bean, asparagus pea, winged pea, winged bean, sesquidillas.”

Note: This is the earliest English-language document seen (Aug. 2007) that uses the word “sesquidillas” to refer to the winged bean. Address: 1. Dep. of Human Nutrition, London School of Hygiene and Tropical Medicine; Former Director, Nutrition Div., FAO, Rome, Italy.

479. Japan Dietetic Assoc. Corp. (JDAC). 1964. [Standard composition of Japanese foods]. Tokyo: Daiichi Shuppan K.K. 124 p. [Jap; Eng]

• **Summary:** The basic source of information on the nutritional composition of all Japanese foods.

480. Taira, Harue; Taira, Hirokadzu; Sakurai, Y. 1964. Daizu

kakôhin no amino-san ni kansuru kenkyû. V. Nattô seizô kôtei-chû no aminosan [Studies on amino acid contents of processed soybean. V. Variation of total and free amino acid contents in “natto” processing]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 17(4):248-50. [12 ref. Jap; eng]

Address: Nôrinsho, Shokuhin Sogo Kenkyujo, Tokyo, Japan; Tokyo Daigaku Nogaku-bu.

481. Watanabe, Minoru. 1964. *Nihon shokuseikatsu-shi* [History of Japanese food culture]. Tokyo: Kichikawa Kobunkan. 330 p. Illust. Index. 21 cm. [Jap]

• **Summary:** Amazake (p. 43), tofu (p. 3, 129), natto (p. 147), miso (p. 3, 88, 102, 130, 149, 203-05, 241, 288, 301, 314), shoyu (3, 149, 202, 241, 301).

Amazake: There were two types of fermented foods in Japan prior to the 8th century A.D.: The sake line and the hishio (*chiang*) line. The sake line used mainly rice as an ingredient but barley (*mugi*), broomcorn millet (*kibi*), glutinous mountain yam (*yama imo*), and fruits were also used. The hishio line led to miso and soy sauce. Both the early Japanese classics *Kojiki* (A.D. 712) and the *Nihon Shoki* (A.D. 720) mention sake. From burial mound tombs created during the period A.D. 300 to 600 have been excavated groups of stone burial objects which are thought to be sake making implements. The earliest sake was made from glutinous rice (*mochi-gome*); it was quite sweet, thick, and glutinous/sticky, and was called “one night sake” (*hitoyo-zake*). It was thick like today’s amazake base before it has been diluted, and was probably served on tree leaves and eaten, rather than being drunk as a beverage. After the arrival of foreigners in Japan bringing brewing methods, regular rice started to be used to make drinks with a high alcohol content. Salty and/or pungent condiments (*karami*) were also added. Japanese cedar or cryptomeria (*sugi*) or bamboo leaves may have been used as preservatives. All of these beverages were thick grogs, not clarified sake. Moreover, unlike in later eras, they were not used to add color/pleasure to people’s daily life. Rather they were used mainly at religious festivals and ceremonies.

482. *Daizu ni Kansuru Shiryo (Statistics on Soybeans and Soyfoods in Japan)*. 1964-- . Serial/periodical. Tokyo: Norinsho, Engei Kyoku, Tokusan-ka (Japan Dep. of Agriculture, Forestry, and Fisheries). Annual. 26 cm. [30 ref. Jap]

• **Summary:** This annual publication of the Ministry of Agriculture, all in Japanese, is the single best unified source of statistical information on soybeans and soyfoods in Japan. By the 1970s the name of the publishing organization had changed to Norin Suisan-sho, Nosan Engei Kyoku, Hatasaku Shinkoka. The average length of a volume was 146 pages in the 1960s, increasing to 170 pages in the 1980s.

Table of Contents for the 1984 Edition reads: I. Finding where soybeans fit (in Japanese agriculture) (p. 1). 1.

Changes in the size of area of the cultivated fields (p. 1). 2. Changes in usage of land (p. 2). 3. Changes in the rate of usage of cultivated fields (p. 6). 4. Converting rice fields to other crops (p. 7).

II. Production trends (p. 14). 1. Results of production (p. 14). 2. Present status of management (p. 28).

III. Grant money system (p. 56). 1. Outline of grant money system for soybeans and rapeseeds (p. 56). 2. Changes in the standard price of soybeans and the amount of soybeans subject to the grant money (p. 58). 3. Results of the regulated sales of soybeans (p. 59). 4. Monthly changes in the price of soybeans (p. 60). 5. Standards of inspection of soybeans (p. 62). 6. The present status of inspecting and ranking soybeans (p. 66).

IV. Outlines of the budget of the countermeasure of promoting the production of soybeans (p. 70). 1. Changes in the budget (p. 70). 2. Outline of budget of soy-related items in 1984 (p. 72). 3. The present status of enforcement of the enterprises (p. 82).

V. Varieties of soybeans (p. 86). 1. Table of the soybean varieties which were registered as Norin Bango (agriculture & forestry number) (p. 86). 2. Table listing the main existing varieties (p. 96). 3. Table of the varieties which each prefecture recommends (p. 102). 4. The status of planting different varieties of soybeans (p. 104).

VI. The present status of management techniques of cultivation (p. 109). 1. The season of soybeans in the main producing prefectures (p. 109). 2. Outline of the national association of promoting the improvement of management of beans in 1983 (p. 112).

VII. Trend of demand for soybeans (p. 132). 1. Changes in the demand for and the rate of self supply of soybeans (p. 132). 2. The status of demand for soybeans by year (p. 133). 3. Changes in the amount of soybeans imported for food use and the amount of soybeans used in various items (p. 133). 4. The results of production, shipping, and the usage of raw materials of miso and shoyu (p. 136). 5. The status of consumption of processed soybean products (p. 140). 6. Nutrients of soybeans and soybean products (= soyfoods) (p. 144). 7. Long term view (p. 150). 8. Changes in the rate of making soybeans as merchandise (p. 150). 9. The status of the production of soybeans in main producing countries (p. 151). 10. Changes in the amount of soybean production in the USA (p. 152). 11. The amount and the price of exported soybeans of main exporting countries, by countries (p. 153). 12. The amount and the price of imported soybeans of the main importing countries, by countries (p. 154). 13. The Japanese import situation for soybeans, by years and countries (p. 156). 14. The imported amounts, exported amounts, and the domestic prices by years (p. 162). 15. Changes in the soybean tax (p. 164).

483. Matsubara, Hiroshi; Kasper, Charles B.; Brown, Douglas M.; Smith, Emil L. 1965. Subtilisin BPN<sup>7</sup>. I.



Physical properties and amino acid composition. *J. of Biological Chemistry* 240(3):1125-30. March. [32 ref]

• **Summary:** Among the proteolytic enzymes, the amino acid sequences of chymotrypsin and of trypsin are now known. Partial sequences around the reactive serine residue have been reported for one strain of subtilisin.

We have undertaken a study of the subtilisin from *Bacillus subtilis* [the natto bacterium] strain N<sup>o</sup> (5).<sup>7</sup> Although certain features of this enzyme have already been described, we have undertaken a more complete study prior to an investigation of its amino acid sequence.

Note: This is the earliest English-language document seen (Jan. 2012) that mentions the enzyme “subtilisin” in connection with natto. It is an alkaline proteolytic enzyme. Address: Univ. of Utah College of Medicine, Salt Lake City, Utah; Univ. of California Medical Center, Los Angeles 24, California.

484. Hesseltine, C.W. 1965. A millennium of fungi, food, and fermentation. *Mycologia* 57(2):149-97. March/April. [38 ref]

• **Summary:** A landmark, widely cited work on indigenous fermented foods. Interestingly, it makes no mention of amazake, or kanjang (Korean soy sauce). Contents: Tempeh. Ragi. Sufu (describes process, mentions pehtzes and the mold *Actinomucor elegans* NRRL 3104).

Color photos (sent by Dr. Clifford Hesseltine) show: (1) Luxuriant growth of *Actinomucor elegans* mold on some skewered cubes of tofu in an incubator; on the top row are uninoculated cubes. (2) Cubes of sufu in their final form after removal from brine.

Thamnidium (meat tenderizer and flavor enhancer from the mold *Thamnidium elegans*). Miso. Shoyu (incl. tamari. “In China, shoyu is more of the tamari type, that is, more soybeans are used and less wheat,...”). Tea fungus. Ang-Kak (p. 179-81). Advantages of fermenting foods. The future of food fermentations.

The glossary gives brief descriptions of aga-koji, akakoji, amylo process, anchu, angkak, anghak, ang-quac, anka, anak, arack, arak, arrack, atsumandie, awamori, bagoong, bakhar, beni-koji, benikoji, braga, brem, busa, chao, ch’au yau (Chinese name for shoyu), chee-fan (a type of Chinese cheese or sufu), chiang (Chinese equivalent of miso), chicha, Chinese cheese (sufu), Chinese red rice (ang-kak), chiu-chu (Chinese yeast), chiu-niang (Chinese term for koji), chou [ch’ü] (Chinese equivalent of koji), dahi, dawadawa (made from African locust bean—*Parkia filicoidea*; soy is not mentioned), dhokla, dosai, fermentation of citron, fermented fish, fermentation of maize, fermented minchin (wheat gluten), fermented soybeans (“a Chinese food prepared from small black soybeans.” See A.K. Smith 1961 [fermented black soybeans]), fish paste, fish sauce, fish soy, fu-yu, fu-yue, fuyu (see sufu [fermented tofu] for all 3), ginger beer plant, grib, hamanatto, hon-fan [fermented

tofu], hongo, hung-chu, idli, injera, jamin-bang, java yeast, jotkal, kaffir beer, kanji, katsuobushi, katyk, kefir, ketjap, kimchi, kishk, kisselo mleko, koji, kombucha (tea fungus fermentation), kome-miso, kuban, kumiss, kumys, kushik, kushuk, kvass, kwass, kyoku-shi, lao-chao, leben, lebeny, levain of khasia, levain of sikkin, lontjom (ontjom), magou, mahewu, maize fermentation of the maoris, mazun, medusen tee, meen, meitauza, meju (fermented soybeans of Korea), mén, mien (Chinese yeast), mirin, mish, miso, moromi, mugi miso, murcha, nappi, nata, natto, ngapi, nuoc-mam, nukamiso, ontjom, patis, paw tsay, peh-khak, pehtze, peujeum, peyem, poi, prahoc, pulque, raggi, ragi, ranu, red pepper sauce, red rice, red sufu, sajur asin, saraimandie, sekihan, shiro koji, shottsuru, shoyou, sho-yu, shoyu, soja japonais (shoyu), sonti (a rice beer wine of India), South African fermented corn, soy, soybean cheese [fermented tofu], soy sauce, sufu, su fu [both fermented tofu], sweet flour paste, taette, tahuli, tahuri [both “Philippine fermented soybean curd”], takuwan, tamari, tane koji, tao-cho [taotjo], taokoan [pressed or firm tofu, not fermented], tao dji (see taotjo {sic}), tao-si ([fermented black soybeans]; see Handbook of Philippine Agriculture. 1939. p. 132-43), tao-tjung, tao-yu, taotjo, tapej, tape ketan, tape ketella, tarhana, tea beer, tea cider, tea fungus, teekwass, teeschwamm, tempe, tempeh, tempeh bongkrek, tempeh kedelee, thamnidium, thumba, tibi, tien mien chang [chiang], tojo, tokua, torani, tosufu, toyo, trassi, tsue fan, tuwak, uri, u-t-iat, wunder pilz, yen-tsai.

Note 1. This is the earliest document seen (Oct. 2011) that mentions *Actinomucor elegans* in connection with sufu [fermented tofu]. In 1966 Hesseltine describes it as the best mold for use in making this fermented food.

Note 2. This is the earliest English-language document seen (Oct. 2011) that uses the terms “fuyu” or “fu-yue” or “chao” to refer to fermented tofu.

Note 3. This is the earliest document seen (July 2000) that mentions “mugi miso”—a type of miso made with barley koji. By the mid- to late-1960s, macrobiotic companies in the USA were importing barley miso from Japan and labeling it “Mugi Miso.”

Photos show: (0) Clifford W. Hesseltine (portrait). (1-3) *Rhizopus oligosporus* mold, used to make tempeh (3 views). (4) Skewered cubes of sufu in an incubator, with one skewer of uninoculated tofu cubes and three rows of tofu inoculated with *Actinomucor elegans* showing luxuriant growth of mold. (5) Cubes of Chinese cheese [fermented tofu] removed from brine. (6) Dilution plate of tane koji showing different types of *Aspergillus oryzae*. Address: NRRL, Peoria, Illinois.

485. De, Sasanka S. 1965. The present state of protein-rich food development in Asia and the Far East. *J. of Nutrition and Dietetics (India)* 2(3):166-76. July. [23 ref]

• **Summary:** Gives an excellent account of soymilk production in Asia during the mid-1960s and a brief history

of the FAO/WHO/UNICEF/Protein-rich food program. “The First International Conference sponsored by FAO, WHO and Josiah Macy Jr. Foundation (New York) held in Jamaica in 1953, discussed the biological, technical and pathological aspects of protein malnutrition. The next Conference on ‘Human protein requirements and their fulfillments in practice’ held in Princeton in 1955 under the same sponsorship, gave detailed consideration to the testing of new protein rich foods before their use in child feeding was recommended.

“The Protein Advisory Group (PAG) was established by the Director-General of WHO in 1955 to ‘act on behalf of WHO in rendering advice to FAO and UNICEF on the safety and suitability for human consumption of proposed new protein-rich foods.’ The PAG... became a tripartite FAO/WHO/UNICEF Protein Advisory Group in 1961.”

Soybean milk: “In 1939, K.S. Lo established a firm known as ‘Hong Kong Soyabean Products’ to produce sterilized bottled soya milk. The two plants of the firm in Hong Kong produce 12,000 cases (24 x 7-oz. bottles per case) a day.”

Also discusses miso, natto, tempeh, full-fat soya flour, soya presscake and meal, groundnut protein isolate. Address: Regional Office for Asia and Far East, FAO, Bangkok, Thailand.

486. Kamada, H.; Ebine, H.; Nakano, M. 1965. Nattô to miso genryo toshite no daizu hinshitsu no hantei-hô [Evaluation method of the quality of soybean employed for natto and miso manufacturing]. *Nippon Jozo Kyokai Zasshi (J. of the Society of Brewing, Japan)* 60(7):620-23. July. [8 ref. Jap] Address: 1. Karepisu [Calpis] Shokuhin Kenkyujo.

487. Shibamoto, G. 1965. [Experimental studies on the nutritive effect of natto. III]. *Tokyo Ika Daigaku Zasshi (J. of Tokyo Medical College)* 23:367-70. [Jap]\*

488. Arimoto, Kinitaro; Sakurai, Yoshito. 1965. Food and nutrition in Japan. In: Martin S. Peterson and Donald K. Tressler, eds. 1965. *Food Technology the World Over. Vol. II. South America, Africa and the Middle East, Asia.* Westport, Connecticut: AVI Publishing Co., Inc. ix + 414 p. See p. 359-94. Illust. Index. 24 cm. [13 ref]

• **Summary:** This chapter, after the Introduction, is divided into two parts: 1, titled “Nutrition (p. 360-74)” by Arimoto, and 2, titled “Food technology” (p. 374-94)” by Yosito [Yoshito] Sakurai. In Part 1, table 110, “Food supply in Japan” includes average statistics on soybeans, miso, and shoyu in kg/year and gm/day for 1944-1948, 1961, and 1961. in kg/year for the three periods: Soybeans: 3.5, 5.4, and 5.0. Miso: 10.6, 8.1, and 7.7. Shoyu: 15.9, 13.0, and 11.1. Source: Ministry of Agriculture and Forestry, Balance Sheets. Surprisingly, supplies were greater for each during and immediately after World War II than in the early 1960s.

Table 116, “Intake of foods classified into food groups and type of work (gm per capita per day), 1963” gives statistics for the entire nation, agricultural households, and non-agricultural households, as follows: Soybeans: 1.3, 1.7, 1.0. Miso: 25.1, 30.1, 22.5. Soybean products: 37.3, 29.9, 41.5. Seaweeds: 4.6, 4.2, 4.7. Shoyu: 26.2, 30.0, 23.6. Soybean products as a source of high quality protein are discussed (p. 366).

Part 2 begins with a section on “Rice” (p. 374-77) which notes that rice supplies half the calories in the Japanese diet. Japan produces all of the rice it needs—about 13 million tons. Imported rice (about 150,000 tons) is used only as a raw material in confections and miso. Japan imports most of its soybean from the USA and China, and these soybeans are processed by characteristically Japanese methods to make tofu, miso, and shoyu (p. 377).

Animal husbandry is not widely practiced in Japan, largely because the land is hilly with few grazing lands. Thus most beef, pork, and chicken are imported. The production of cow’s milk is gradually increasing; it is now 27 million hectoliters.

Packaging of foods has changed greatly during the past decade. Packaged foods are now common. Shoyu and miso, once sold by the measure, are now sold in bottles and plastic bags, respectively. Table 128 (p. 378), titled “Supply of raw materials and food consumption of their products in 1959 (Japan)” shows the following for soybeans (in metric tons = tonnes). Soybeans—Domestic supply: 410,000 tonnes. Imports: 1,000,000 tonnes. Miso consumption: 850,000 tonnes. Shoyu: 1,280,000 tonnes. Tofu: 640,000 tonnes. Aburaage 170,000 tonnes. Natto 60,000 tonnes. Meat 330,000 tonnes. Fishery products: 6,170,000 tonnes.

The section titled “Soybeans” (p. 380-86) has the following contents: Introduction. Miso, shoyu, natto, tofu, koritofu (dried tofu) [dried-frozen tofu], yuba. Photos show: (1) Shoyu brewing in tanks in a large factory. (2) Pressing and washing of tofu in koritofu manufacture in a large, modern factory. (3) Aerial view of a large, modern plant for koritofu production. (4) The thawing operation in making koritofu. (5) The drying operation in making koritofu. Address: 1. PhD, Director, National Inst. of Nutrition, Tokyo, Japan; 2. PhD, Prof., Dep. of Agricultural Chemistry, Faculty of Agriculture, Tokyo Univ., Tokyo, Japan.

489. Brandemuhl, William. 1965. Soybean utilization in Japan. San Francisco, California. xxii + 478 p. Unpublished manuscript. 28 cm. [189 ref]

• **Summary:** A superb, in-depth, pioneering study, based on extensive original field research in Japan. It is carefully documented with hundreds of original interviews and published sources properly cited in two different lists of sources (numerical and alphabetical) Contains 30 tables and 190 excellent photos—including 7 of the author.

Table of contents: Preface. Notes. List of tables. List

of figures. Map. Part I: Background. 1. The soybean: Birth and spread (legend, botanical inception, Nagata's theory of origin, spread to Japan and beyond, the American story).

Part II: Japan's production and supply of soybeans. 1. Japan the country and supply of domestic soybeans (Japan the country, domestic soybean production, planting and harvesting, marketing domestic soybean). 2. Importation of Red Chinese soybeans (background, mechanics, advantages, and prospects). 3. Importation of U.S. soybeans (history, method and mechanics of importation, the American shippers, concluding comments on importation). 4. Distribution (use in brief, super-wholesaler, wholesaler, retailer wholesaler, Japan's grain exchange).

Part III: Soybean utilization in Japan. 1. Utilization of soybeans for oil and meal (oil crushing history, soybean source, delivery of soybeans, the crushing industry, liberalization of soybean oil and meal, oil utilization in Japan, meal utilization in Japan). 2. Tofu (history, use of soybeans, manufacture, the tofu factory, marketing tofu products, recently developed tofu products, tofu as food, concluding comments). 3. Miso (importation, home production of miso, quantity of miso produced, soybean used for producing miso, kinds of miso, fermentation time, comparison of miso firms, manufacturing, packing and marketing, price, instant miso, use of miso, miso consumption outlook). 4. Shoyu (introduction, production and manufacturers, manufacture, raw materials, preparation of raw materials for natural shoyu, preparation of materials for chemical method shoyu, preparation of materials for mixed method shoyu, fermentation, filtering and pressing, sterilization, bottling, price, use of shoyu, miscellaneous shoyu products, concluding comments). 5. Natto (description, history, Daitokuji natto, the natto industry, consumption, natto soybeans, processing, making cost and price, marketing, use of natto, problems, new ideas and natto products). 6. Frozen tofu (history, development, frozen tofu soybeans, processing, freezing, defrosting, drying, treatment with ammonia and packing, marketing, preservation, use). 7. Kinako. 8. Yuba (history and development, the plight of the yuba industry, soybeans for yuba, manufacture, classification of yuba, use). 9. Tsukudani and nimame (description, soybean tsukudani, nimame). 10. Hamanatto (history, manufacture, use). 11. Edamame. 12. Moyashi (manufacture, use). 11. Miscellaneous products (fermented soybean curd, MSG, confectionary products, other products). Conclusion. Sources (numerically arranged). Sources (alphabetically arranged).

Tables: 1. U.S. soybean production, 1924-1963. 2. United States, Red China, and world production of soybeans (bushels), 1950-1963. 3. U.S. soybean importation, exportation and amount processed for oil and meal, 1924-1963. 4. U.S. exportation of soybeans (1,000 bushels) total, by continent, and to six largest importing countries, 1958-1962. 5. Japan's soybean acreage, production, and

merchandising rate. 6. Japan's importation of soybeans, total, and Red China's portion, 1945-1963. 7. Japan's total importation of soybeans and U.S. portion, 1945-1963. 8. Soybean usage in Japan, 1963. 9. Japan's processing of oilseeds, 1963. 10. Crushing capacity of selected Japanese oilseed crushers. 11. Eight largest crushers of soybeans and amount of soybeans crushed per month in 1963. 12. Total quantity of soybeans crushed in Japan, 1950-1963. 13. Japan's daily per capita intake of edible fats and oils. 14. Japan's consumption of edible fats and oils, 1945-1961. 15. Use of soybean meal. 16. Chemical composition of tofu and aburaage. 17. Quantity of soybeans and soybean meal used for tofu-aburaage productions (all Japan), 1950-1963. 18. Miso production and quantity of soybeans and soybean meal used, 1950-1963. 19. Composition of miso. 20. Daily per capita consumption of miso in Japan, 1950-1963. 21. All Japan production of shoyu and use of soybeans and soybean meal, 1950-1963. 22. Composition of shoyu. 23. Yearly per capita consumption of shoyu, 1950-1963. 24. Composition of natto. 25. Production of frozen tofu and use of soybeans. 26. Composition of frozen tofu. 27. Yearly per capita consumption of frozen tofu. 28. Composition of kinako. 29. Composition of yuba. 30. Monosodium glutamate production and use of soybeans and soybean meal. Continued.

This typed manuscript was sent to Soyfoods Center in July 2004 by Tomoko Brandemuhl, the wife of the author. About the author (based on several interviews with Tomoko, July 2004): William Victor Brandemuhl was born on 30 Nov. 1940 at Iron Mountain, Michigan. He grew up in Florence, Wisconsin, then attended the University of Wisconsin at Madison. He roomed for 3-4 years with various Japanese cancer researchers at the university. He also became close to Tomoko Arai (born 12 Dec. 1937 in Tokyo), a Japanese woman, who was doing graduate studies in social work there as a Rotary International Fellowship student. William initially intended to graduate in June 1962, but stayed an extra year in order to pursue independent studies in Japanese language and soybeans. He became interested in the soybean and its history in an anthropology class taught by Dr. R.J. Miller; William finished his excellent research paper on soybeans in Jan. 1963. He also took one year of Japanese language instruction (night classes). William graduated in Jan. 1963 with a BSc degree in economics.

William obtained a grant (no strings attached) from Honeymead Products Co. of Mankato, Minnesota, to study soybean utilization in Japan. Only one American had studied this subject in Japan after World War II—Alan K. Smith of the USDA, who visited Japan and wrote short but detailed reports in 1948-49 and 1958. In Jan. 1963 Brandemuhl arrived in Japan and became a research fellow at the Department of Agricultural Economics, Kyoto University, Kyoto, Japan. Between Feb. 1963 and May 1964 (15 months) he conducted field research on soybean utilization in Japan. In June 1963 (after William had been in Japan for 4

months), Tomoko completed her graduate studies, graduated from the University of Wisconsin, and (since her scholarship was finished), returned to Japan—to be with William and to help him with his research in Japanese, which he spoke only moderately well. She traveled with him throughout Japan and translated for him during the many interviews he conducted. At each destination, she spoke about America to the local Rotary club—which paid her transportation, room, and board. William’s monthly check from Honeymead paid for his room and board—but not for his travel and research, so he had to work part time doing English translation for a Japanese company. On trips, he took many photos using his expensive Nikon camera. Tomoko’s family lived near Kobe, where she and William were married on 8 Aug. 1964—three months after he finished his field research. Several days after the marriage, they returned to the USA to visit his parents in Florence, Wisconsin, and enjoy a wedding party there.

William now knew he wanted to pursue a career in international business. He was soon offered a job at Crocker Citizen National Bank (International Division) in San Francisco, California. They drove to San Francisco and got an apartment at 1701 21st Avenue; he began work that fall, and was soon learning the basics of international business. Every evening after work at the bank he returned home to work on transforming his field notes into a manuscript. As he wrote the rough draft, Tomoko (a skilled pianist but not a skilled typist) typed it on a manual typewriter. The next day he would correct any mistakes and she would retype each page into final form. In 1965 he had the best carbon copy bound and sent it to Honeymead; he kept the original. It was never published and he received no academic credit for it.

On 26 May 1966 their first son and only child, Konrad Victor Brandemuhl, was born in San Francisco. They bought a house in Pacifica. In 1967 he was offered a job with Caterpillar Tractor Co. (International Div.) in Peoria, Illinois. In 1968 he moved with his boss to work at Allis-Chalmers Manufacturing Co., West Allis, Wisconsin. In 1969 he was transferred to Tokyo, Japan, as Far East Representative of the company. In 1970 he was transferred to Singapore as Far East Manager of the company.

William and Tomoko later lived for about 10 years near Tokyo, Japan (mostly in Mitaka), and for a while in Singapore. Over the years he showed his typescript on “Soybean Utilization in Japan” to many people, but nobody was interested. In 1986 he started his own trading company, specializing in textiles, natural rubber, latex thread, and various machine mechanisms. Tragically, William died on 2 April 1998 in Bangkok, Thailand, of pneumonia, during a business trip. He loved the excitement of international business and interaction with people of different cultural backgrounds. Address: San Francisco, California.

490. Brandemuhl, William. 1965. Soybean utilization in Japan: Figures (Document part). San Francisco, California.

xxii + 478 p. Unpublished manuscript. 28 cm. [189 ref]

• **Summary:** 1. Black soybeans from Japan’s Tanba region and American Harosoy soybeans. 2. Soybeans growing on a dike. 3. Soybean plants drying on rack. 4. Soybean plants drying just prior to harvesting. 5. Soybean plants drying just prior to harvesting. 6. Soybean harvester. 7. Depodding rack and pod filled stalk. 8. Depodding soybeans. 9. Entrance to the Red Chinese Trade Fair held in Tokyo, during April, 1964. 10. One of the agricultural exhibits at the Chinese Trade Fair (corn and soybeans). 11. Soybeans and soybean plants exhibited at the Chinese Trade Fair. 12. Soybeans and other bean products that Red China is capable of exporting (exhibition at the Red Chinese Trade Fair). 13. Soybeans on display at retail store. 14. Soybeans on display at retail store. 15. Barge unloading of soybeans at oil mill. 16. Barge unloading of soybeans at oil mill. 17. Soybean tank receiver at oil mill. 18. Multi-spout soybean feeder at barge side. 19. An oil gift assortment.

20. Selling oil at a small oil retail shop. 21. Dispensing oil. 22. Selection of oil at oil retail shop (notice birds in cage at right). 23. Vegetable oil displayed with petroleum products. 24. Vegetable oil displayed with petroleum products. 25. Bottling facilities at oil wholesaler’s. 26. Bottling facilities at oil wholesaler’s. 27. Prepackaged oil products displayed at wholesaler’s. 28. Seafood fried in soybean oil. 29. Selling soybean oil fried products. 30. Temperature controlled fryer. 31. At a chicken farm. 32. Handling 20 kilograms bags of chicken feed. 33. Soybean meal on top of other components of mixed feed prior to hand mixing. 34. Bag fastener for mixed feeds packed at wholesaler. 35. Fermenting agent for bakery (contains equal quantities of soybean flour, yeast, and water). 36. Silk worms eating mulberry leaves. 37. Silk worms eating soybean protein mixed with mulberry leaves. 38. Tofu. 39. Soybean grinder.

40. Soybean grinder. 41. Soybean grinder. 42. Open pit live steam cooker. 43. Open pit wood-stoked cooker. 44. Okara tank and press. 45. Outdated okara press. 46. Tonyu [soymilk] receiving tanks (precipitation tanks). 47. Removing water from precipitating curd. 48. Pressing tofu with stone weights. 49. Yakidofu. 50. Yakidofu being dipped into a shaping box. 51. Mechanical press for pressing yakidofu. 52. Cutting yakidofu. 53. Roasting yakidofu. 54. Kinugoshi tofu. 55. Aburaage. 56. Aburaage prior to being deep fried. 57. Frying sushiage, a product similar to aburaage. 58. Frying aburaage. 59. Hiroso: left front; atsuaage: right front; sushiage: left rear; aburaage: center rear.

60. Okara for use as cattle feed. 61. Okara for food use. 62. Overall view of production portion of tofu plant. 63. Tofu peddler. 64. Tofu on display. 65. Bagged tofu. 66. Miso-shiru soup. 67. Dengaku (yakidofu covered with miso and placed over low heat). 68. Aburaage formed as a bag with rice inside. 69. Yudofu, Japan’s most famous but not often eaten

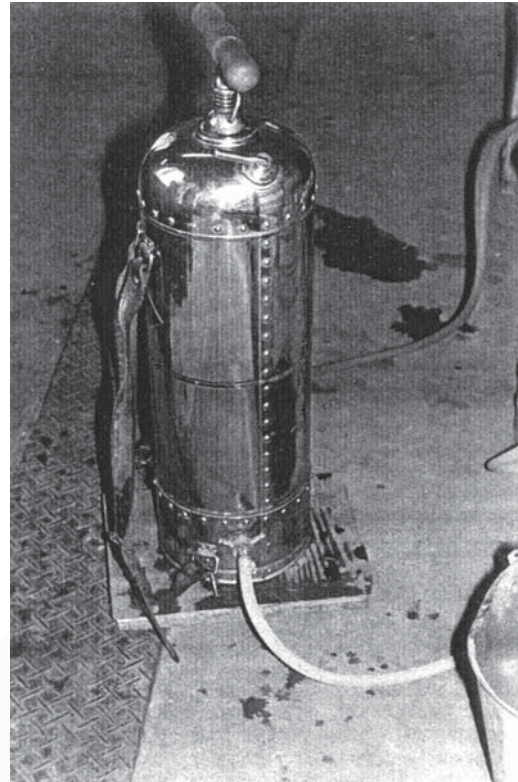
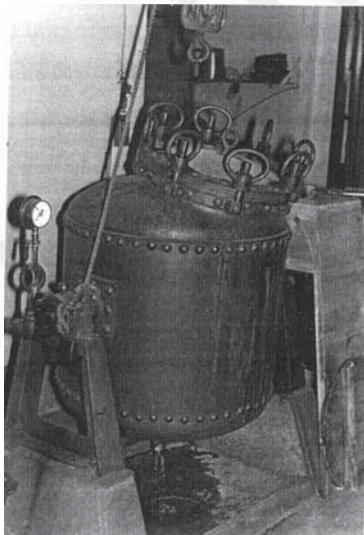
tofu dish. 70. Yudofu. 71. Miso. 72. Fermentation starting material (rice inoculated with bacteria). 73. The first step in making home miso. 74. Mashing soybeans for home miso. 75. Rice koji being used for home produced miso. 76. Salt being added to soybean and koji for the making of home miso. 77. Mixing home miso components. 78. Mixing home miso components. 79. Freshly made home miso.

80. Home miso after one year natural fermentation. 81. Koji maker. 82. Koji filled boxes. 83. Autoclave for steaming soybeans. 84. Koji mixed with salt. 85. Wooden vat for miso fermentation. 86. Weights for pressing miso. 87. Removing miso from fermentation vat. 88. Mixing and grinding miso. 89. Degraining [grinding] miso. 90. Miso on display. 91. Miso packing and sealing instrument. 92. Packing miso in a plastic bag. 93. Beef and rice miso preserver. 94. Seafood and rice miso preserver. 95. Receiving soybean meal at shoyu factory. 96. Saline solution for shoyu production. 97. Fermenting moromi. 98. Equipment used for bubbling moromi. 99. Temperature control of moromi.

100. New moromi. 101. Moromi which has fermented nearly one year. 102. Hydraulic press for pressing moromi. 103. Running moromi into filter cloth. 104. Filter cloth containing moromi. 105. Raw shoyu storage tank. 106. Open press for previously pressed moromi. 107. Opening moromi filter cloth. 108. Removing shoyu kasu (shoyu presscake) from filter cloth. 109. Bagging shoyu kasu for sale as cattle food. 110. Quick method shoyu kasu. 111. Shoyu sterilization instrument. 113. Shoyu bottler. 114. Bottling shoyu by hand. 115. High speed labeling. 116. Hand labeling. 117. Preparing sauce for shipment. 118. Shoyu cold sauce. 119. Filling plastic bottles with shoyu for use in box lunches.

120. Broiled chicken coated with shoyu. 121. Fish marinated in shoyu. 122. Fish baked with shoyu. 123. Grilled eels basted with shoyu. 124. Daitokuji natto (look like raisins spread on a sheet of paper).

125. Cooker for steaming soybeans for natto. 126.

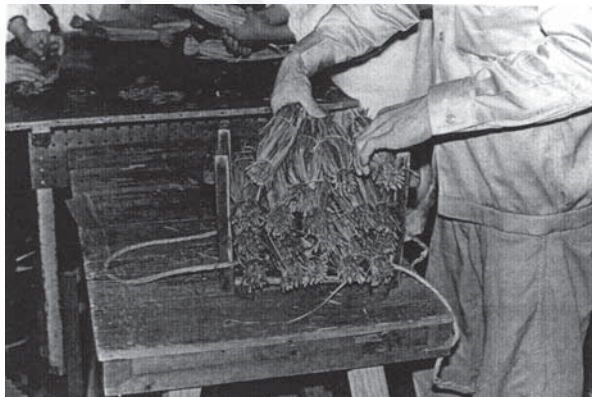
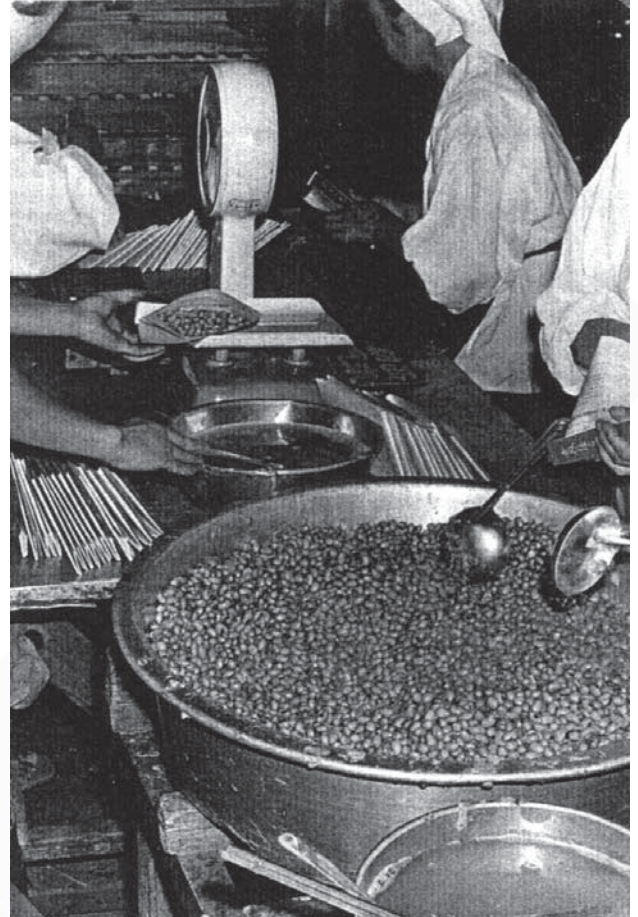


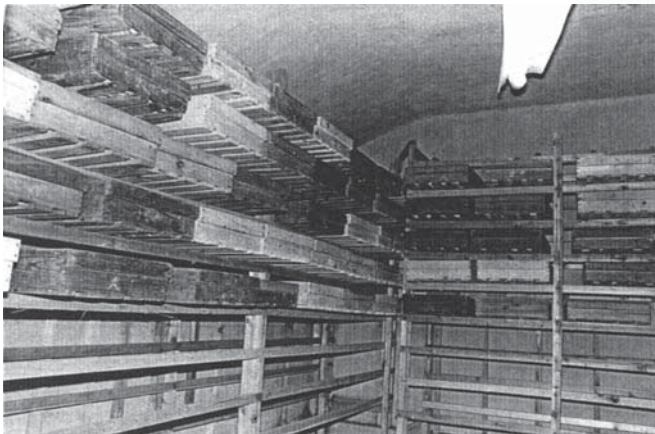
127. Pressurized container for inoculating soybeans. 128. Inoculating soybeans for natto (see next pages). 129. Traditional method of packing natto. 130. Incubation rack and traditional packages of natto. 131. Packaging inoculated soybeans prior to incubation. 132. Packaging inoculated soybeans prior to incubation. 133. Inoculated soybeans in recently introduced containers. 134. Natto incubation room. 135. Natto on display at egg shop.

136. Overall view of frozen tofu factory. 137. Precipitation containers for frozen tofu tonyu. 138. Smoothing frozen tofu curd. 139. Frozen tofu curd flowing into shaping box.

140. Shaping box for frozen tofu curd equipped with sheet metal guide. 141. Removing formed frozen tofu curd from sink. 142. Cutting formed curd into freezing size. 143. Sized curd in  $-20^{\circ}\text{C}$  freezer. 144. Sized curd in  $-5^{\circ}\text{C}$  degree freezer. 145. Defrosting frozen tofu. 146. Removing frozen tofu curd from centrifuge. 147. Inspecting frozen tofu curd for dryness. 148. Drying frozen tofu. 149. Grinding frozen tofu into marketable size. 150. Packing frozen tofu. 151. Frozen tofu on display. 152. Cooked frozen tofu displayed in food shop. 153. Cooked frozen tofu mixed with vegetables. 154. Packing kinako. 155. Kinako on display. 156. Covering pounded rice cake [mochi] with kinako. 157. Yuba. 158. Yuba hanging on rack above tonyu tank. 159. Lifting yuba from tonyu tank.

160. Fresh yuba. 161. Rolling fresh yuba into marketable form. 162. Combining fresh yuba with vegetables. 163.





Rolling dry yuba. 164. Yuba on display. 165. Shoyu vats at tsukudani factory. 166. Tsukudani cooker. 167. Cooling tsukudani. 168. Nimame being marketed. 169. Nimame with shoyu and shrimp. 170. Nimame with shrimp. 171. Selling nimame. 172. Nimame as served. 173. Hamanatto. 174. Sun drying Hamanatto. 175. Close-up of sun-dried Hamanatto. 176. Pressing Hamanatto. 177. Grading Hamanatto. 178. Hamanatto on display. 179. Edamame.

180. Sprouting soybeans. 181. Sprouting soybean covered with straw. 182. Close-up of sprouting soybeans. 183. Sprouting soybeans. 184. Wetting down sprouting soybeans. 185. Soybean sprouts. 186. Mapped sprouts [Note: "Mappe" is not a Japanese word; mappe beans are imported from Burma]. 187. Soybean roasting oven. 188. Roasting soybeans. 189. Soybeans and seaweed. 190. Black soybeans

in pounded rice cake [mochi].

Map of Japan. Address: San Francisco, California.

491. Brandemuhl, William. 1965. Soybean utilization in Japan: List of interviews (Document part). San Francisco, California. xxii + 478 p. Unpublished manuscript. 28 cm. [189 ref]

• **Summary:** Between Feb. 1963 and May 1964 the author interviewed people from the following organizations (listed alphabetically) related to soybean utilization in Japan. In many cases he interviewed the owner, president, or managing director.

1. Agricultural Experimental Farm, Kamigori, Hyogo-ken. 2. Akutagawa Candle Co., Kyoto. 3. Aoki Miso Co., Nagano-ken. 4. Aoki Umbrella Co., Kyoto. 5. Aoyama Candy Co., Kyoto. 6. Bunge Far East Agent, Osaka. 7. Choko Shoyu Miso Co., Nagasaki. 8. Continental Overseas Corp., Tokyo. 9. Daiichi Trade Co., Kobe. 10. Dainihon Ink and Chemical Co., Osaka. 11. Dainihon Pharmaceutical Co., Osaka. 12. Daiya Frozen Tofu Co., Suwako-gun, Nagano-ken. 13. Daizu Yuryo Wholesale and Broker, Kobe. 14. Franceya Chocolate Co., Kyoto. 15. Fuji Oil Co., Osaka. Note: This is the earliest document seen (June 2009) concerning the work of Fuji Oil Co. (Osaka, Japan) with soy.

16. Genroku Brewing Co., Kyoto. 17. Gion Mameheto Candy Co., Kyoto. 18. Hamamoto Tofu Co., Kyoto. 19. Hamano Tofu Co., Kyoto. 20. Hanamura Bread Co., Kobe. 21. Harada Miso Co., Kyoto. 22. Hasegawa Oil Co., Kyoto. 23. Hashizume Tsukudani Co., Kyoto. 24. Hirota Sauce Co., Kyoto. 25. Hohnen Oil Co., Osaka. 26. Honda Miso Co., Kyoto. 27. Ishino Miso Co., Kyoto. 28. Itoh Trade Co., Osaka. 29. Itoh Trade Co., Tokyo.

30. Iwai Trade Co., Osaka. 31. Kaihara Natto Co., Kyoto. 32. Kamejirushi Shinshu Miso Co., Nagano-ken. 33. Kanegabuchi Chemical Co., Takasago-shi, Hyogo-ken. 34. Kanemasu Grain Wholesaling Co., Osaka. 35. Kanematsu Trade Co., Osaka. 36. Kansai Paint Co., Osaka. 37. Kansai Shoji Wholesale Co., Kyoto. 38. Kanto Miso Co., Kyoto. 39. Kasakura Natto Co., Tokyo. 40. Kato Kinako Co., Tokyo. 41. Kido Tofu Co., Tokyo. 42. Kobata Farm, Kyoto. 43. Kobayashi, Michiharu, Kyoto University, Kyoto. 44. Koyasan Frozen Tofu Co., Ito-gun, Wakayam-ken.

45. Kurosawa Miso Co., Nagano-ken. 46. Kyoto Prefectural Agricultural Cooperative, Kyoto. 47. Louis Dreyfus and Co., Tokyo. 48. Mame Masa Candy Co., Kyoto. 49. Marubeni Iida Trade Co., Osaka. 50. Meiji Chocolate Co., Osaka. 51. Midori Natto Co., Tokyo. 52. Mitsui Trade Co., Osaka. 53. Mitsui Trade Co., Tokyo. 54. Moriguchi Natto Co., Kyoto. 55. Morita Frozen Tofu Co., Sasayama, Hyogo-ken. 56. Moriwaki frozen Tofu Co., Taka-gun, Hyogo-ken. 57. Nagata, T., Dept. of Plant Breeding, Hyogo University of Agriculture, Sasayama, Hyogo-ken. 58. Nagoya Miso Co., Nagoya. 59. Nakai Wholesale Co., Osaka.

60. Nakamura Yuba Co., Kyoto. 61. Nakayama Farm,

Kamigori-cho, Hyogo-ken. 62. Nakazawa Soap Co., Kyoto. 63. Namikawa Tofu Co., Kyoto. 64. Naruse Natto Bacteria Co., Tokyo. 65. National Agricultural Cooperative Assoc., Osaka. 66. Nihon Paint Co., Osaka. 67. Nikka Oil Co., Tokyo. 68. Nisshin Meal Co., Kobe. 69. Nisshin Oil Co., Yokohama. 70. Noda Shoyu Co., Takasago-shi, Hyogo-ken. 71. Nomura Meal Co., Kyoto. 72. Nomura Tsukudani Co., Kyoto. 73. Nunoura, Hiroshi, Kyoto Women's University, Kyoto. 74. Oguchi, K., Nagano-ken Shinshu Miso Assoc., Nagano-ken.

75. Ohashi, Taiji, Japan Soap Assoc., Tokyo. 76. Okazaki Natto, Tokyo. 77. O-mame Candy Co., Kyoto. 78. Osaka Grain Exchange, Osaka. 79. Osaka Prefectural Miso Assoc., Osaka. 80. Otsuya Agricultural Brokers, Kyoto. 81. Ryo Tofu Co., Kyoto. 82. Sawai Wholesale Co., Kyoto. 83. Senmaru Yuba, Kyoto. 84. Shimamoto Tofu Co., Kyoto. 85. Shinseimame Candy Co., Kyoto. 86. Sugimori, T., Marukin Shoyu Brewing Co., Kyoto. 87. Tada, H., Kyoto Prefectural College, Kyoto. 88. Taiyozakoku Wholesale Co., Kyoto. 89. Takeya Miso Co., Suwako-shi, Nagano-ken.

90. Tanaka Narazuke, Kyoto. 91. Tatsuna Higashimaru Shoyu Co., Tatsuno-shi, Hyogo-ken. 92. Tawa Chicken Farm, Kyoto. 93. Tofu Aburaage Assoc., Kyoto. 94. Toyo Menka Trade Co., Osaka. 95. Uchida Tsukemono, Kyoto. 96. Ueda Miso Assoc., Ueda-shi, Nagano-ken. 97. Uemura Suhana Candy Co., Kyoto. 98. Uno Tofu Co., Kyoto. 99. Yamajirushi Miso Co., Nagano-ken. 100. Yamamoto Farm, Taki-gun, Hyogo-ken. 101. Yamanaka Oil Wholesale Co., Kyoto. 102. Yamato Bean Sprout Co., Kyoto. 103. Yamaya Hamanatto Co., Shizuoka-ken. 104. Yazura Yahata, Kyoto Textile University, Kyoto.

105. Yoshihara Oil Co., Osaka. 106. Yoshimura, Hyogo University of Agriculture, Sasayama-shi, Hyogo-ken. 107. Yoshizabaru Retail Co., Kyoto. 108. Yubahan Co., Kyoto. 109. Yubakichi Co., Kyoto. Address: San Francisco, California.

492. Koyanagi, Tatsuo; Oikawa, Keiko. 1965. Daizu seihin oyobi shoku-en ga nezumi no hatsuiku oyobi kôjo-sen ni oyobosu eikyô [The effect of soybean products or sodium chloride in diets on the thyroid and growth of rats]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 18(3):190-93. [17 ref. Jap; eng]

• **Summary:** Tests with rats showed that the feeding of heated soybeans, natto (fermented soybeans containing no sodium chloride), miso (fermented soybeans containing sodium chloride) or tofu (soybean curd) produced a high incidence of thyroid enlargement in the rats, but the enlargement was prevented by increasing the iodine content of the diets by a small amount.

The inclusion of sodium chloride in iodine-deficient diets at the 3% level caused a pronounced hypertrophy of the thyroid and weight loss in rats. In this case, the supplementation of iodine alone did not prevent the weight

loss, but adding methionine plus iodine did.

Axelrod et al. have reported that thyroxine production in rats was increased with increasing sodium chloride intake. Thus, the effects of a large intake of sodium chloride resemble in some respects those of administration of thyroxine.

“It is well established that thyroxine increases the metabolic rate and oxygen consumption of animals and beyond small and very critical levels the thyroid hormone decreases growth and feed efficiency. Charkey found that all of these effects of thyroxine can be reversed by methionine. The present findings that methionine prevented the weight decrease of rats fed a diet of high sodium chloride content may be explained by the antithyrototoxic effect of methionine.” Address: Tohoku Daigaku Nôgaku-bu, Eiyo Kagaku Kyôshitsu [Lab. of Nutrition, Faculty of Agriculture, Tohoku Univ., Sendai, Japan].

493. Kurokawa, Kazuo. 1965. Daizu oyobi sono kakkô shokuhin no suiyosei chisso ni tsuite [Study of water soluble nitrogen of soybean and its products]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 17(5):333-36. (Chem. Abst. 64:11768. 1966). [5 ref. Jap; eng]

• **Summary:** The water soluble fraction of the nitrogen in soybean products varied depending on the way that each product was processed. In the case of miso, approximately 60% of the nitrogen was extractable, mostly as formol nitrogen. Address: Tokyo-toritsu Hakuô [Shiro Kamome] Kôtôgakkô.

494. Kamada, Hidemoto; Ebine, Hideo; Nakano, Masahiro. 1966. Nattô to miso genryô toshite no daizu hinshitsu no hantei-hô [Evaluation method of the quality of soybean employed for natto and miso manufacturing]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 21. p. 136-40. Jan. [8 ref. Jap; eng]

• **Summary:** Reprinted from *Nippon Jozo Kyokai Zasshi (J. of the Society of Brewing, Japan)* 60(7):620-23 (1965). Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

495. Nakao, Sasuke. 1966. Saibai shokubutsu to nôkô no kigen [The origin of cultivation and agriculture]. Tokyo: Iwanami Shoten vii + 192 p. See p. 59-75. Series: Iwanami Shinsho. [Jap]\*

• **Summary:** Natto-like fermented soybean foods are manufactured in various Asian countries besides Japan, including eastern Nepal, northern West Bengal and Sikkim provinces in India, Bhutan, northern Myanmar, northern Thailand, and Yunnan province in China; these places overlapped the “laurel forest zone in South Asia and Southeast Asia” Address: Ethnologist, Japan.

496. Taira, Harue; Taira, Hirokadzu; Sakurai, Y. 1966. Daizu



kakôhin no amino-san ni kansuru kenkyû. V. Nattô seizô kôtei-chû no aminosan [Studies on amino acid contents of processed soybean. V. Variation of total and free amino acid contents in “natto” processing]. *Shokuryo Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 21. p. 219-21. Jan. [12 ref. Jap; eng]

• **Summary:** Reprinted from *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 17(4):248-50 (1964). Address: 1-2. Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

497. Tamura, Shinhachiro; Kenmochi, Kuniko; Watanabe, Tokuji. 1966. Tanpaku bunkai kôso-zai o kongô, konnetsu shita baai no daizu tanpaku no kasui bunkai ni tsuite [Hydrolysis of soybean protein by mixing with protease preparation]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 21. p. 129-35. Jan. [4 ref. Jap; eng]

• **Summary:** The action of several protease preparations on soybean protein was studied to elucidate the possibility of making cheese-like products from soybean. Dried frozen tofu (kori-dofu) was powdered then mixed with the protease solution, kneaded for 30 minutes, then allowed to stand for 24 hours at 45°C while digestion / hydrolysis took place.

Under the proper conditions, products with about the same level of total free amino acids as processed cheese can be produced. “Although some were good, most of them had a rather queer taste and dark color.” The pattern of free amino acids in those products was somewhat different from that of cheese.

The possibility that these products could be “used as a cheese-like food or a raw material for some processed foods is discussed.”

Reprinted from *Nihon Shokuhin Kogyo Gakkai Shi (J. of Food Science and Technology)* 11(10):438-43 (1964). Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

498. Watanabe, Tokuji; Ebine, H.; Ohta, T. 1966. Daizu shokuhin no kakô gijutsu [Technology of soybean processing]. *Shokuryo Kenkyujo, Shokuryo Gijutsu Fukyu Shirizu (National Food Research Institute, Extension Series of Food Technology)* No. 4. 61 p. March. [Jap] Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan (Norinsho Shokuryo Kenkyujo).

499. Hayashi, Shizuka. 1966. There’s an increasing trend to soybean oil in Japan. *Soybean Digest*. May. p. 68-69.

• **Summary:** In 1965-66 some 1,852,000 tonnes of soybeans were used in Japan. Of this, 1,341,000 tons (74.5%) were crushed, 297,000 tons (16.0%) were made into tofu and frozen tofu, 150,000 tons (8.1%) were made into miso, 32,000 tons (1.7%) were made into natto, and 32,000 tons were made into soy sauce and other soy products.

Crushing the soybeans yielded 1,073,000 tons of soybean meal. Of this, 736,000 tons (68.6%) was used for animal feeds (largely as a component of mixed feeds), 174,000 tons (16.2%) to make shoyu, 65,000 tons to make tofu, 63,000 tons for other food uses, and 35,000 tons for other non-food uses. Thus, a little over 50% of all soybeans used in Japan in 1965 were used to make foods—not including soy oil.

Per capita consumption of edible oil in Japan has increased dramatically, from 7.52 grams per day in 1956 to 18.44 grams in 1965. During the same period, total soybean oil consumption has risen from 74,010 tonnes to 219,967 tonnes. In recent years a number of the large soybean crushing companies, such as Hohnen, Nikkoh, Nisshin, Showa, and Yoshiwara have expanded their extraction plants. “The various soybean food processors including soy sauce, miso, and tofu are consolidating into fewer large-scale plants with financial support from the government for improvement and better efficiency.” Address: Japanese American Soybean Inst.

500. Takahashi, Hideo; Saito, Hiuga; Ikeda, Yonosuke. 1966. Genetic relatedness of spore bearing *Bacilli* studied by the DNA agar method. *J. of General and Applied Microbiology (Tokyo)* 12(2):113-18. June. [11 ref]

• **Summary:** “Two methods by which one can compare the structural homology of two DNA’s are known: the density method... and the DNA agar method.” Address: Inst. of Applied Microbiology, The University of Tokyo, Bunkyo-ku, Tokyo, Japan.

501. Swaminathan, M. 1966. The use of soyabean and its products in feeding infants and in the prevention of protein malnutrition in weaned infants and pre-school children in developing countries. *Indian J. of Nutrition and Dietetics* 3(4):138-50. Oct. [63 ref]

• **Summary:** Contents: Introduction. Chemical composition: Carbohydrates, fat, minerals, vitamins, proteins. Factors affecting the nutritive value of soya proteins: Trypsin and growth inhibitors, heat processing, other factors. Nutritive value of soya proteins (with or without methionine supplementation): Experiments with animals, experiments with human beings, supplementary value to other food proteins. Processed foods from soyabean for feeding infants and preschool children: Milk substitutes and infant foods, processed protein foods based on soya (soya flour, Multipurpose Food or MPF, soup powder). Foods based on soyabean and other oilseed meals: Precooked roller dried foods, extrusion-cooked full-fat soybean flour. Other soya products (soy protein isolate, tofu, natto, miso, tempeh, soy sauce). Conclusion. Address: Central Food Technological Research Inst. (CFTRI), Mysore, India.

502. [Commodity classification: Yearly amount of

expenditures, quantities by commodities per household by cities, groups, districts, cities within prefectural government (all households)]. 1966-1981. Serial/periodical. Tokyo: Norinsho, Government of Japan. Serial/periodical. Tokyo: Norinsho, Government of Japan. [Jap]

• **Summary:** Gives statistics for the quantities consumed per household and the amount expended (in yen) for the following foods: Soybean products, tofu, fried tofu, natto, other soybean products, sea vegetables (nori, wakame, kombu), and umeboshi. Statistics are for the following groupings: (1) City groups (All Japan, all cities, cities with population of 50,000 or more, major cities, middle-sized cities, small cities, towns and villages); (2) Districts (Hokkaido, Tohoku, Kanto, Hokuriku, Tokai, Kinki, Chugoku, Shikoku, Kyushu, Okinawa); 49 major cities.

For example, for tofu in 1981: The average Japanese household consumed 86.91 cakes (cho). Consumption per household was highest in small cities (92.04 cakes) and lowest in major cities (84.19 cakes). In the districts, consumption per household was highest in Tohoku (northeast Japan, 101.91 cakes) followed by Chugoku (98.15), and lowest by far in Hokkaido (the soybean production center of Japan, 58.28 cakes). The major cities with the highest per household consumption are Toyama (capital of Toyama prefecture in northeast Japan, 118.96 cakes) and Morioka (capital of Iwate prefecture in northeast Japan, 118.42 cakes). The major city with the lowest per household consumption is Sapporo (capital of Hokkaido prefecture, Japan's northernmost island, 59.83 cakes).

For natto, the major consuming district was Tohoku, followed by Hokkaido, then Kanto. The city with the largest per household consumption was Mito, followed by Aomori, then Morioka and Utsunomiya. Address: Tokyo, Japan.

503. Kitasato, T.; Omae, K.; Okayama, T. 1966. [Viscous substances of natto. III. Purification of viscous substances]. *Scientific Report of the Faculty of Liberal Arts Education, Gifu University (Natural Science)* 3:539-40. (Chem. Abst. 68:2003. 1968). [Jap]\*

504. Tanegashima, C.; Kirita, Y. 1966. [Investigation of pyridine carbonic acids. II.]. *Mukogawa Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.-Domestic Science Series)* 14:81-83. [Jap]\*

505. Urakami, C.; Sakamoto, R.; Takada, A.; Tanaka, H.; Furuhashi, N.; Uemura, T. 1966. Effects of <sup>60</sup>Co on natto 1966. *Radioisotopes (Japan)* 15:228-33. \*

506. Ebine, Hideo. 1966. Fermented soybean foods in Japan. Tokyo: Tropical Agricultural Research Center, Ministry of Agriculture and Forestry. 20 p. \*  
Address: National Food Research Inst., Tokyo, Japan.

507. Milner, Max. 1966. General outlook for seed protein concentrates. *Advances in Chemistry Series* No. 57. p. 52-64. Chap. 5. World Protein Resources. [8 ref]

• **Summary:** "Seed proteins, particularly those of the cereals and legumes, are mainstays of human protein nutrition, providing several times more of this nutrient than animal proteins..."

"World Protein Resources: The cereals contribute in round numbers 75 million metric tons of protein, of which wheat provides 25 million, rice 12 million and corn 20 million tons. The legumes, consisting of various beans, peas and lentils, in aggregate, provide, surprisingly, only about 8 million tons. Additional but minor plant sources of protein are tubers, including potatoes, and nuts. The world animal protein supply, including principally meat, milk, eggs, and fish, has been estimated to be about 20 million metric tons. And finally, the potential contribution of the oilseeds, which include principally soybeans, cottonseed, and peanuts, can be considered to be about equal to that of all the animal protein now available, 20 million tons per annum."

A long section titled "Soybeans" (p. 57-59) discusses soybeans and soyfoods, including tofu, miso, natto, tempeh, soybean milk, full-fat soybean flour, soy protein concentrates and isolates, and spun soy protein products. Address: UNICEF, United Nations, New York, NY; Present address: Office of Technical Cooperation and Research, Agency for International Development, Washington, DC.

508. Nelson, Andrew Nathaniel. 1966. The modern reader's Japanese-English character dictionary. Revised ed. Rutland, Vermont, and Tokyo, Japan: Charles E. Tuttle Co. 1109 p. Index. 24 cm. [15 ref. Jap; Eng]

• **Summary:** Radical 37 = dai or oh = big + 3 strokes = #1171 = *daizu* or *ôname* = soy bean (p. 290).

Radical 75 = tree; at left = ki hen. #2211 = *eda* of *edamame*. Radical 82 = Hair of animals, *ke*. Radical 85 = Water + 11 strokes = *soymilk*. Radical 151 = Bean + 7 strokes = *mame* (bean) or *tou* = *toufu*. Radical 164 = Liquid (Sake *sukuri*) + 11 strokes = *shoyu no sho*. Radical 201 = Yellow (variant is 11 strokes).

Soy related words: (1) Miso: *miso* (fermented [soy] bean paste; flattery, p. 247). *miso o tsukeru* (to make a mess of, p. 247). *miso shiru*, *misojiru* (bean-paste soup, p. 247). *miso mame* (soybeans, p. 247). *misoni* (boiling with bean paste, p. 247). *misozuke* (pickled in bean paste, p. 247). *misokoshi* (bean-paste strainer, p. 247). *misosuri* (grinding bean paste; flattery, p. 247). *temai miso* (self praise; bean paste of one's own making, p. 420). *miso dengaku* (tofu baked [grilled] with miso, p. 621). *konamiso* (powdered miso, p. 691). *nuka miso* (salted rice-bran paste, for pickling, p. 694). *karamiso* (salty miso, p. 869).

(2) Tôfu [tofu]: *yakkodôfu* [*yakkodofu*] (tofu cut in cubes, p. 47). *kôridôfu* [*kori-dofu*] (frozen tofu, p. 75). *unohana* (refuse from tofu, p. 119). *shimidôfu*, *kogoridôfu*

[shimi-dofu, kogori-dofu] (frozen tofu, p. 192). *age* (fried tofu, p. 447). *kara, okara* (tofu refuse, p. 525). *aburage* (fried tofu, p. 543). *yuba* (dried tofu [sic], p. 561). *yakidôfu* [yaki-dofu] (broiled bean curd, p. 578). *nama-age* (fried tofu, p. 618). *dengaku* (tofu baked with miso, p. 621). *inarizushi* (fried tofu stuffed with seasoned rice, p. 668). *tofu* (bean curd, tofu, p. 843). *kirazu* (tofu refuse [okara], p. 941). *kôyadôfu* (frozen tofu, p. 978).

*toshi no mame* ([soy] beans of the bean scattering ceremony, p. 88).

*mitsumame* (boiled [soy] beans with treacle / molasses, p. 328).

*edamamé* (green soybeans, p. 494). *irimame* (parched [soy] beans, p. 576). *nimame* (boiled [soy] beans, p. 578).

*nattô* (fermented soy beans, p. 697).

*tamari* (soy sauce, p. 564).

*azemame* (soy beans grown on rice-field ridges, p. 624). *moyashi* (artificially sprouted beans, p. 780). *moyashi mame* (beans for sprouting, p. 781). *hôrai mame* (sugar-coated beans, p. 786).

*kuromame* (black soy bean, p. 992).

*mame abura* (soybean oil, p. 843). *tônyû* (soybean milk, p. 843). *kinako* (soybean flour, p. 991). Address: PhD, Tokyo, Japan.

509. Schenk, E.G.; Naundorf, G. 1966. Lexikon der tropischen, subtropischen und mediterranen Nahrungs- und Genussmittel [Dictionary of tropical, subtropical, and Mediterranean foods and food adjuncts (stimulants / enjoyables)]. Herford, Germany: Nicolaische Verlagsbuchhandlung Herford. xiv + 199 p. Index. 21 cm. Series: Manualia Nicolai 1. [200\* ref. Ger]

• **Summary:** Pages 70-71 give a list of Japanese foods (after Mayerhofer and Pirquet 1926) in no apparent order, with the Japanese name followed by a translation of that name into German. Included in the long list are: Akamiso, miso, shiromiso, tofukasu [okara], daizu, fu [dried wheat gluten], kingyo-fu, kiri-fu, kiri-mochi [frozen and dried rice cake], ame [malt extract], mirin, aburage [tofu fried in vegetable oil], natto–Bohnenkäse, Tofu–Sojatopfen, Tonyu–Sojamilch, azuki [small red beans], kwansen-fu, kinako–Sojabohnenmehl, geröstet, amasake–unvergorener Sake, umeboshi, koritofu [frozen and dried tofu], midzuame [soft ame = rice syrup], shoyu–Sojasauce, yuba–eine Bohnenspeise. Plus many types of sea vegetables.

On pages 140-42 the following terms are defined in German: Soja [soya], Sojabohne [soybeans], Sojabohnenkäse [soy cheese or tofu], Sojabohnenmehl [soybean meal], Sojabohnenöl [soybean oil], Sojakäse [fermented soy cheese], Sojamilch [soymilk], Soja-Nahrungsmittel [soyfoods]: Koji, Miso, Tofu, Nato [sic, natto], kondensierte Soja-Milch [condensed soymilk], Japanische Verarbeitungen [Japanese processed foods: Japanische Soja-Sauce Shoyu (Shoyu), Miso, Tofu], Soja-Nahrungsmittel, japanische

[Javanese] soyfoods: Tao-Hoe, Tempeh, Ketjap, Tao-Tjong [a term, and perhaps a product, between *doujiang* and *tao-tjo*, Indonesian-style miso], Sojatunken, Soja-Verarbeitungen: Sojamilch, Bohnenkäse, Teoufou (China), Tofu (Japan), Dan Phu (Vietnam), Natto (Japan), Tao-tehe (China).–Bohnenbrei Miso (Japan), Tao-tjiung (*doujiang*, China).–Sojasauce: Shogu [sic, Shoyu] (Japan), Tsiang-Yeou, Tao-yu (China), Ketjap (Java), Tuong (Vietnam).–Gärmittel: Kiut see (Japan). Then a table shows the nutritional composition of 8 of these foods.

Note 1. This book contains more than its fair share of errors and could be better organized.

Note 2. This is the earliest German-language document seen (May 2005) that uses *Sojabohnenkäse*, the German word meaning “soybean cheese,” to refer to tofu. Address: I. Prof. Dr. med. habil., Dr. phil. nat, Laurensberg ueber Aachen, Germany.

510. Fujii, Hisao; Oki, Kuniko; Makihara, Miyoko; Keshino, Junko; Keshino, R.; Takeya, Ryuko. 1967. Nattô-kin ni yoru nenshitsu-butsumo no seisei ni kansuru kenkyû. VII. Nattô-kin faaji no bunrui to sono ippan teki seishitsu [On the formation of mucilage by *Bacillus natto*. VII. Isolation and characterization of a bacteriophage active against “natto”-producing bacteria]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 41(1):39-43. Jan. (Chem. Abst. 67:8826). [15 ref. Jap]

• **Summary:** “A new bacteriophage was isolated from an abnormally fermented ‘natto’ and named phage PN-1... The phage had a hexagonal head about 75m $\mu$  in diameter and a tail with a swollen end.” The tail was about 240 m $\mu$  long, 10 m $\mu$  wide in the middle, and 25m $\mu$  at the swollen end. This phage was found to attack 9 strains of the 23 tested, all belonging to the *Bacillus subtilis* group.

The 9 susceptible strains were all characterized by their ability to produce natto and had been named *Bacillus natto* (Table 2).

Note 1. This is the earliest English-language document seen (Jan. 2012) that contains the word “phage” or the word “bacteriophage” in connection with natto.

Note 2. The word “phage” derives from the Greek, “to devour.” A bacteriophage is any one of a number of viruses that infect bacteria. They do this by injecting genetic material (in either a circular or linear arrangement), which they carry enclosed in an outer protein capsid. Bacteriophages are among the most common and diverse entities in the biosphere. The term is commonly used in its shortened form, “phage.” (Source: Wikipedia, at Bacteriophage). An illustration at this Wikipedia entry is titled “The structure of a typical myovirus bacteriophage.” Myovirus bacteriophages use a hypodermic syringe-like motion to inject their genetic material into the cell.

Bacteriophages (and their ability to kill harmful bacteria) were discovered independently in 1915 by British

bacteriologist Frederick Twort (in London) and in 1917 by French-Canadian microbiologist Félix d'Hérelle (working at the Pasteur Institute in Paris). Address: Faculty of Home Life Science, Fukuoka Women's Univ., Fukuoka, Japan.

511. Ohta, Teruo; Nakano, Masahiro; Kobayashi, Y.; Muto, H. 1967. Dai ikkai Zenkoku Nattô Kanhyôkai no sôgô seiseki [Report of the first All-Japan "Natto" Exhibition, April 1965]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 22. p. 68-91. March. (Chem. Abst. 66:104143. 1967). [1 ref. Jap; eng]

• **Summary:** In order to promote consumer acceptability and to rationalize the natto manufacturing process, 56 samples of natto products were collected from throughout Japan. They were submitted to sensory evaluation and chemical analysis, and the soybean varieties and manufacturing facilities of each natto maker were investigated. Results:

1. Soybeans: 59% were grown in China, 30% in Japan, and 2% in the USA. The remaining 9% were a mixture of these.

2. The distinctive factor of natto that received the highest sensory evaluation is the production of sufficient mucous substance which shows long-lasting viscosity with fine elastic threads that develop uniformly.

3. No correlation was found between the origin or type of soybeans and the natto quality.

4. Natto is still made in the traditional way, and the scale is mostly domestic or home based.

The outline of the natto-making process can be summarized as follows: Soak the soybeans in water at 15-20°C for 15-20 hours or at 7-10°C (winter) for 20-24 hours. Steam under pressure for 30-40 minutes at 1 to 1.2 kg per square cm, or for 15-30 minutes at 1.5 to 2.0 kg. Inoculate with a pure-culture natto starter after the temperature of the soybeans has decreased to: (a) 70°C. (b) 40-60°C. (c) Below 30°C. These three traditional temperatures appear to make no difference in the final product. Pack 80-120 gm of weighed, inoculated soybeans into a container made of wood shavings or synthetic film. Ferment the soybeans in the containers (often with many containers on shelves in a rolling rack) for 15-20 hours in a small incubation room, keeping the temperature at 40-50°C.

5. The shelf life of fresh natto has been prolonged by the installation of cold storage (refrigeration). 30-45% of natto makers sell their natto refrigerated, depending on their location in Japan.

Natto given the highest scores in sensory evaluation had the following characteristics: Moisture around 60%. Protein water-solubility 45-60%. Protein decomposition rate (amino acid formation) 5-6%. Ammonia formation rate 4-5%. Ph value 7.2 to 7.4. Curdrometer hardness 30-40 gm. unit. Colorimetric Rd is 16-22. Address: 1-2. Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

512. De, Sasanka S.; Russell, J.S.; André, L.M. 1967. Soybean acceptability and consumer adoptability in relation to food habits in different parts of the world. *USDA Agricultural Research Service. ARS-71-35*. p. 20-27. May. Proceedings of International Conference on Soybean Protein Foods. Held 17-19 Oct. 1966 at Peoria, Illinois. [1 ref]

• **Summary:** Contents: Traditional soy products in the Far East: Soysauce, soy milk, bean curd, tempeh, natto and miso, roasted soy flour, kochu chang [Korean soybean miso], sprouted beans. Introduction [of soybeans] in other countries: Brazil, USSR, Africa, Latin America, Turkey. New types of products: Defatted soy flour, full-fat soy flour and beverages made from it developed by the Soybean Council of America. Justification: Cost of a pound of protein from different foods. Beef \$4.60. Pork \$4.30. Poultry \$1.50. Nonfat dry milk solids \$0.41. Dry beans \$0.35. Soybeans \$0.14. Attempted introductions: India. Factors involved in adoptability.

"Kochu chang is produced in every household in Korea from mashed boiled [soy] beans which are hung in bags for 2 to 3 months. The product is broken up, dried, and ground. It is then mixed with ground red pepper [plus salt and water] and kept for some time before use."

This paper was presented by Leon Marie André.

Note 1. This is the earliest English-language document seen (Jan. 2007) that contains the term "roasted soy flour." We read (p. 22): "This product is produced in small amounts and consumed with rice cake [mochi]. There is hardly any information on the nutritive value of the product."

Note 2. This is the earliest English-language document seen (March 2009) that uses the word "kochu chang" (or "kochu-chang") to refer to Korean-style red pepper and soybean paste (miso). Address: 1-2. Food and Agriculture Organization of the United Nations, Rome, Italy; 3. FAO Liaison Officer and adviser to UNICEF.

513. Fischer, R.W. 1967. The use of soy in food products. *Soybean Digest*. May. p. 29, 31-32, 35-36, 38.

• **Summary:** An excellent overview, with considerable history. Contents: Introduction. Grisly hand of hunger. Soybean oil. Oriental soy foods. Soy flour and grits (with a good history of Berczeller, A.E. Staley, Shellabarger, Allied Mills, J.R. Short Milling Co. and Wytase). Isolates and concentrates. The war years (during and immediately after World War II, soy flour and grits come to be widely disliked). New products and know-how.

"Oriental soy foods:... In the Orient soybeans have, for centuries, played an important part in human diets as soy milk for infants, shoyu, or soy sauce as we call it, miso, tofu, tempeh, kinako, natto, yuba, etc."

"Isolates and concentrates: In the mid-1930's processes for further refining the protein factors of soy began to appear. The first 70% soy protein concentrate was turned out by Mead Johnson Co. using the Bonato process of sulfur dioxide and sulfurous acid extraction, but was discontinued

for lack of adequate markets for the product. In 1936 the Glidden Co. began working on the production of an isolated protein [90-100% protein] from extracted soy flakes for industrial uses. Glidden, as a major manufacturer of resin, wanted the isolate as a stabilizer for the resin used in sizing paper to provide wet strength. By 1939 Glidden was producing an enzyme hydrolyzed isolated protein to be used with egg albumen for its whipping capacity in producing food toppings... Over the years soy protein isolates have found their greatest application in the industrial field, particularly as paper coatings for high gloss products.”

A photo shows cans of Worthington Choplets, Soyameat (3 varieties), and Numete—all made from spun soy protein fibers. Address: Soypro International Inc.

514. Standal, Bluebell R. 1967. Amino acids in Oriental soybean foods: Determined by column chromatography. *J. of the American Dietetic Association* 50(5):397-400. May. [18 ref]

• **Summary:** The author used column chromatography to determine the amino acid content of various Oriental soybean preparations. Methionine was the limiting amino acid in all foods. Table 1 shows the amino acid content of the following foods: Tofu, edamame (green soybeans), soybean sprouts, natto, miso, mungbean sprouts (*Phaseolus aureus* Roxb) and whole egg. Table 2 shows the amino acid ratio, essential amino acids index, protein score, and net protein utilization (NPU) for each food. Eggs had the highest NPU (90.9), followed by edamame (72.2), tofu (65.0), soybean sprouts (56.0), and natto (44.0). The first three foods are sources of good quality vegetable proteins. Address: Div. of Nutrition, Dep. of Home Economics, Univ. of Hawaii, Honolulu.

515. Orr, Elizabeth; Adair, David. 1967. The production of protein foods and concentrates from oilseeds. *Tropical Products Institute Report* No. G31. 104 p. June. Also titled T.P.I. Report (London). [44 ref]

• **Summary:** Contents: Foreword. Acknowledgements. Introduction. 1. The use of oilseeds as a source of protein. 2. Oilseed resources. 3. The manufacture of protein flours by standard oil milling processes. 4. Some cost aspects of the manufacture of protein flour by standard oil milling processes. 5. Examples of the use of edible flours made by standard oil milling processes. 6. Full fat soya flours. 7. Oriental methods of processing soya. 8. Other processes for making protein products. 9. The distribution of protein products. 10. Current experience of making protein flours and foods from oilseeds. 11. The initiation of protein food programmes with particular reference to the role of the administrator. Appendices. 1. Protein nutrition. 2. Oilseed statistics. 3. Toxic hazards. 4. P.A.G. Guides [PAG]. 5. Aflatoxin. 6. Questionnaire. 7. Some examples of the cost of packaging oilseed-based protein foods. 8. Prices of edible

oilseed products and protein flours and foods made from oilseeds. Bibliography. Chapters 6 and 7 are especially relevant to soyfoods.

“Full fat soya flour (FFSF) is manufactured in the USA by Archer Daniels Midland Co. and Central Soya, and in the UK by 3 firms: British Arkady Co. Ltd., Soya Foods Ltd., and British Soya Products Ltd. There are no official statistics for production in either country. A trade source of information has estimated UK usage of soya flour at 30,000 tons per annum, but this figure includes defatted soya flour made from meal imported from the USA. Full fat soya flours can be divided into 2 main categories: (a) flours used primarily for bleaching purposes in bread, and (b) general purpose flours. When the flour is to be used mainly for bleaching it is made from uncooked beans, since the natural enzymes in the bean must remain active until the bleaching process has been completed. It is estimated that about half the full fat soya flour made in the UK is used in bread manufacture.”

A table lists all known commercial full-fat soy flours, their composition and prices. Describes the Promo Process and Wenger Process for making FFSF, with cost data. Gives case histories for Pronutro in South Africa and Nutresco in [Southern] Rhodesia.

Chapter 7. Kinako. Fermentation products: Soya sauce (shoyu), miso, natto, tempeh. Developing the use of fermented products. Aqueous extracts: Soya milk and tofu, kori-tofu. Soya milk as a substitute for cow's milk. The package soy milk shop (including Tetra Pak and Prepac packaging; the Prepac system, developed by the S.E.A.B. Co., Villejuif, France, has a capacity of 1,500 packs/hour). Case histories for soya milk: Rural cooperatives in Taiwan, Saridele in Indonesia, and Vitasoy in Hong Kong. Soya milk made from soya flour: The 4 known manufacturers are Promo Ltd. of the U.K. (“The product made by Promo is marketed under the brand name of ‘Velactin’ by the Wander company.”), and Loma Linda Foods (Soyalac and Granogen), Mead Johnson (Sobee or Soybee), and Borden's Soy Processing Co., all of the USA. Promo and Loma Linda use the traditional Oriental method rather than using soy flour.

Note: This is the earliest document seen (Sept. 2002) concerning Tetra Pak and soy. Address: TPI, 56/62 Gray's Inn Road, London WC1.

516. Tada, Masakazu. 1967. Some features of Japanese Buddhism. *British Vegetarian*. May/June. p. 225-28.

• **Summary:** For 1,850 years Japan kept no livestock farms as one sees in Europe. The main source of animal protein was only from fish and shellfish. But modern Japanese, especially those living in big cities, think animal protein is indispensable. One important feature of Japanese vegetarianism is the development and use of fermented foods, such as miso, shoyu, and natto. Address: Dr., 718

Daisen, P.O. Nirayama, Shizuoka, Japan.

517. Hesseltine, C.W.; Wang, Hwa L. 1967. Traditional fermented foods. *Biotechnology and Bioengineering* 9(3):275-88. July. [8 ref]

• **Summary:** Contents: Summary. Introduction. Fish fermentations. Soybean and peanut fermentations: Koji, shoyu, miso, hamanatto, natto, ontjom, sufu, tempeh. Discussion: Advantages of preparing foods by fermentation. Address: NRRL, Peoria, Illinois.

518. *Nutrition Reviews*. 1967. Soy fibers—A new approach to vegetable protein acceptability. 25(10):305-07. Oct. [6 ref]

• **Summary:** The subtitle summary states: “Fibers have been formed from soybean protein and incorporated into meat analogs. The process, its nutritional and economic aspects, and the mechanism of fiber formation are described.”

Traditional foods made from soybeans include tofu, natto, miso, and tempeh. U.S. food manufacturers have developed a new process for making “fibers from isolated soy protein, and for incorporating these fibers into meat-like analogs which may find consumer acceptance as a meat substitute in this country. These products should be cheaper than meat and can be made as or more nutritious than meat by addition of the missing vitamins and minerals.” The final products, meat analogs, typically contain (on a dry basis) 40% soy fiber, 10% protein binder (usually egg albumin), 0-50% fat and/or 0-50% flavors, colors, and supplemental nutrients.

519. Kasuya, Ritsu; Ikehata, H.; Miyamoto, T.; Murata, K. 1967. Nattô to tempeh no B-rui bitamin [B-vitamin content of natto and tempeh]. *Kaseigaku Zasshi (J. of Home Economics of Japan)* 18:362-64. [10 ref. Jap] Address: Osaka, Japan.

520. Tanegashima, C.; Kirita, Y. 1967. [Investigation of pyridine carbonic acids. III.]. *Mukogawa Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.—Domestic Science Series)* 15:75-79. [Jap]\*

521. Tsukasa, N.; Iso, N.; Suyama, Y. 1967. [Study on natto's mucilage. I. Physical and chemical properties of the mucilage]. *Meiji Daigaku Nogakubu Kenkyu Hokoku (Bulletin of the Department of Agriculture, Meiji University)* 22:45-50. (Chem. Abst. 69:92968. 1968). [Jap]\*

522. Bose, Saradindu. 1967. Carrying capacity of land under shifting cultivation. Calcutta: Asiatic Society. ix + 155 p. See p. 33, 141. Illust. Maps (part fold.). 25 cm. • **Summary:** Page 141 states that Bekang is a food made from soyabean.

Note 1. Bekang is a fermented soyfood found in Mizoram, a state in northeastern India.

Note 2. This is the earliest document seen (Jan. 2012) that mentions Bekang, a close relative of Nepalese kinema and Japanese natto. By implication, this is probably the earliest document seen (Oct. 2010) concerning soybeans in Mizoram, and the cultivation of soybeans in Mizoram. Address: India.

523. Nakano, Masahiro. ed. 1967. *Hakkô shokuhin [Fermented foods]*. Tokyo: Korin Shoin. 244 p. See esp. p. 81-101. [Jap]

• **Summary:** Includes sections on soymilk yogurt (cultured with *Lactobacillus bulgaricus*) and *nyu fu* [fermented tofu].

Chapter 6, *Nyu fu* notes that this is an ancient food that came from China and Taiwan, but has never become a part of Japanese cuisine. In the United States (and in English) it is known as “Soybean cheese” and “Vegetable cheese,” while in China it is known as “Nyufu” as well as Chaw taufu, Sufu, Funyu, etc.

6.1.2—Places of production and varieties: Nyufu is made mainly in the middle to southern four coastal provinces of China. These include (pinyin / Wade-Giles): Jejiang / Chekiang (Jap: Sekkô), Jiangsu / Kiangsu (Jap: Kôso), Fujian / Fukien (Jap: Fukken), Guangdong / Kwangtung (Jap: Kanton). A lot of Nyufu is also made in Taiwan, which is located off the coast of Fujian province.

Since nyufu has been produced for a long time over a vast area, there are many varieties. A study conducted in the 1920s found the varieties shown in chart 6.1 in the Shanghai market (Shanghai is in Jiangsu province near the mouth of the Yangtze River).

(1) Pickled without mold on the tofu. (i) Jianning-dofu: Drain then dry the tofu, add salt, and pickle in jiang or the residue / dregs left after making soy sauce.

(ii) Doufuru: Drain then dry the tofu. Sprinkle it with salt then pickle it in koji.

(2) Culture mold on small cubes of tofu until a fragrant white mycelium surrounds each cube, then pickle.

(iii) Jiangrufu: Pickle in jiang or the residue / dregs left after making soy sauce.

(iv) Honjiang rufu [red jiang fermented tofu]: Pickle in a mixture of red rice / angkak (a red koji made by growing *Monascus* mold on rice) and the residue / dregs left after making soy sauce.

(v) Zaorufu: Pickle in sake lees.

(vi) Hongrufu: Pickle in red sake lees.

(vii) Jiujia rufu: Pickle in white sake / daku-shu, like unrefined sake (*doburoku*).

(viii) Xiangrufu (fragrant rufu): Pickle in jiang with olive leaves, fragrant mushrooms, etc.

Dr. Masahiro Nakano was born in 1907. Address: National Food Research Inst., Tokyo.

524. Kameda, Yukio; Kanatomo, S.; Kameda, Y.; Saito, Y. 1968. A contact antitumor activity of *Bacillus natto* on solid

type Ehrlich carcinoma cells. *Chemical and Pharmaceutical Bulletin* 16(1):186-87. Jan. [2 ref]

• **Summary:** The authors have been searching for familiar bacteria that have high selective toxicity on human tumor cells. "The first choice was the bacillus of 'Natto' (fermented Japanese beans) which is a popular and cheap daily food for Japanese."

They found a strain (tentatively called KMD 1126) of *Bacillus natto* (the natto bacterium) which had contact antitumor activity in male inbred mice. "A mouse was transplanted intraperitoneally with approximately 10<sup>7</sup> Ehrlich ascites carcinoma cells." A table shows in detail the antitumor effect. The tumors on the treated side of each mouse were either nonexistent or much smaller than those on the untreated side.

Note: In medicine, ascites (also known as peritoneal cavity fluid) is an accumulation of fluid in the peritoneal cavity. The peritoneum is the smooth, transparent membrane that lines the cavity of the abdomen of humans and other mammals, and is folded inward over the abdominal and pelvic viscera. Address: Faculty of Pharmaceutical Sciences, Kanazawa Univ., Kanazawa, Japan.

525. Shibasaki, Kazuo; Asano, Mitsuo. 1968. [Histochemical studies of soybean cotyledons]. *Nippon Shokuhin Kogyo Gakkaishi (J. of Food Science and Technology)* 15(1):1-7. [6 ref. Jap; eng]\*

Address: Dep. of Food Chemistry, Faculty of Agriculture, Tohoku University, Japan.

526. Hongo, Motoyoshi; Yoshimoto, Akihiro. 1968. Formation of phage-induced gamma-polyglutamic acid depolymerase in lysogenic strain of *Bacillus natto*: Short communication. *Agricultural and Biological Chemistry* 32(4):525-27. April. [5 ref]

• **Summary:** Describes how the "lysogenic strain releases phage-induced PGA depolymerase in its culture fluid and the enzyme may be able to cleave PGA to small peptides, but not to glutamic acid." Address: Lab. of Applied Microbiology, Dep. of Agricultural Chemistry, Kyushu Univ., Fukuoka, Japan.

527. Watanabe, Bunzo. 1968. The Japanese oilseed processing industry. *Soybean Digest*. May. p. 36, 38.

• **Summary:** Tables show: (1) Imports of soybeans to Japan during calendar year 1967 by country of origin: USA 81%, Red China 19%, Other countries 1%. Total imported: 2,169,000 metric tons (79,710,000 bushels). (2) Consumption of edible refined oils and fats in Japan (1963-1967). Per capita consumption rose from 13.58 lb in 1963 to 18.08 lb in 1967. (3) Total oils and fats production in Japan (1963-1967), imports and domestically grown, by oilseed type. Soybeans are by far the most important oilseed, followed by rapeseed. Rice bran is the main domestic source

of oil. (4) Consumption of soybeans in Japan classified by utilization (1963-68, 1,000 metric tons). The following figures are for 1968 (1,000 metric tons): Crushed for oil 1,739. Foods: Tofu and aburage 294. Miso 170. Natto 50. Frozen tofu 40. Shoyu 15. Kinako 13. Other 70. The total used for food grew from 497 in 1963 to 652 in 1968.

Photos show: (1) American Soybean Association (ASA) executives seated around a table holding chopsticks at tempura luncheon with Mr. Watanabe, who is president of the Japanese Oilseed Processors Association, and other Japanese oilseed officials. From left, Shohei Takai, managing director Japan Oilseed Processors Association (JOPA); S. Yamada, manager oils and fats division, Ajinomoto Co., Inc; Scott Sawyers, ASA country director in Japan; Chet Randolph, ASA executive vice president; Mr. Bunzo Watanabe; and Hiroshi Higashimori, chief secretary JOPA. Tempura is a substantial outlet for soy oil. (2) Portrait of Bunzo Watanabe. Address: Japanese Oilseed Processors Assoc., Japan.

528. Saio, Kyoko; Watanabe, Tokuji. 1968. Daizu shokuhin no bisai kôzô [Observations of the minute structure of soybean foods, as seen under an electron microscope]. *Nippon Shokuhin Kogyo Gakkaishi (J. of Food Science and Technology)* 15(7):290-96. [8 ref. Jap]

• **Summary:** Of the electron microscopic pictures taken in the investigation on protein bodies and the protein in soybean seeds, some were presented to elucidate their fine structures and their changes in processing. No change in protein bodies and spherosomes in intact cells of soybean cotyledons occurred as a result of soaking in water overnight, while remarkable changes, such as bursting of protein bodies, curdling of their protein in mass without dissolving, and converting of spherosomes into rather large oil droplets, were observed after successive heat-steaming and fermentation with *Bacillus natto*. In tofu gel, a network is formed with protein microgranules, and oil droplets located in groups along it. The meshlike structure of the fresh tofu used to make dried frozen tofu (kori-dofu) is denser than that of ordinary tofu. During freezing, protein microgranules are localized and denatured by the growth of ice crystals (from the online abstract at <http://www.journalarchive.jst.go.jp/english/>).

This is the earliest document seen (Jan. 2012) that describes the use of an electron microscope to examine soyfoods. Address: Food Research Inst., Ministry of Agriculture & Forestry, Koto-ku, Tokyo.

529. Ebine, Hideo; Sakano, K. 1968. [Production of miso from natto]. *Miso no Kagaku to Gijutsu (Miso Science and Technology)* No. 173. p. 23-. [Jap]\*

Address: National Food Research Inst., Tokyo.

530. Kurisu, H.; Iwasa, A.; Iizawa, K. 1968. [Effect of tablets of bacillus natto on the enteric bacterial flora in humans and

animals]. *Eisei Shikenjo Hokoku (Report of the National Institute of Hygienic Sciences)* 86:99-103. [Jap]\*  
Address: Japan.

531. Potorzhinskii, V.P. 1968. [The production of fermented and delicatessen soy sauces]. *Prikladnaya Biokhimiya i Mikrobiologiya (Applied Biochemistry and Microbiology)* 413-17. [Rus]\*

532. Tanegashima, C.; Kirita, Y. 1968. [Investigation of pyridine carbonic acids. IV.]. *Mukogawa Joshi Daigaku Kiyo. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.—Domestic Science Series)* 16:93-98. [Jap]\*

533. Tsuno, S.; Matsumoto, M. 1968. [Studies on the nutritional value of Natto Prorich II. Part I Purification and some properties of the protease]. *Kobe Daigaku Kyoikugaku-bu Kenkyu Shuroku (Bulletin of the Faculty of Education, Kobe University)* 40:49-60. [Jap]\*

534. Borgstrom, Georg. 1968. Principles of food science: Food microbiology and biochemistry (Vol. 2). New York, NY: Macmillan. xiv + 473 p. Index. 26 cm. [9 ref]  
• **Summary:** In Chapter 4, “Fermentation,” is a section titled “soybeans” (p. 110-12) which discusses: Tofu or teou-fu, miso, sufu, natto, tempeh, taotjo and ketjap (shoyu / soy sauce).

“Frozen tofu (kori tofu, or koya dofu) is tofu that has been frozen for several weeks and dried. Aburage is fresh tofu dried in deep fat. Namage is fresh tofu that has been surface-fried.”

In Chapter 10, “Trends in food utilization,” is a section titled “Soybean” (p. 297-301) which discusses: Soybean products and fermented products (“These foods are all rather unknown among Western peoples, although they are eaten by millions of people and constitute some of the most common foods on earth.” Yet some “typical oriental soy foods,” such as tofu and tempeh, are finding acceptance in the West. One soy product that is widely used in most parts of the world is soy sauce. Soy flour and soy grits were first made commercially in the USA in the early 1930s. Milk made from the soybean is important in China {see Vol. I, Chap. 15}. Fermented products include taotjo, soy sauce or ketjap). Soybean protein, including soybean oil and defatted soybean oil meal (In 1961, 9.5 million tons of soybean oil meal was used in the USA, mainly for animal foods, with special grades used for food and industrial products, such as isolated soybean protein. Purified proteins extracted from dehulled and defatted meal, when toasted, are used in “Civil Defense emergency rations” and by the “international organization Meals for Millions.” Some 90% of the processed soybean oil in the USA now goes into food uses. Soybean oil is now the most important ingredient in oleomargarine {see Fig. 10.1}. About one-third of the soybeans moved off the

farm are exported; Japan is our biggest customer {taking about 57%} followed by Western Europe {27%}, Canada {8%} and Israel {5%}). Soybean uses (Despite its nutritive value, “the soybean is not looked upon with favor in many areas” for two main reasons: it does not soften well during cooking and it is difficult to digest. Many other legumes share these problems, but they are generally require less cooking. When soy flour is used, alone or with cereal flours, the drawbacks almost vanish. “Soybean milk is not comparable to animal milk or human milk except in protein content.” And it usually has an unpleasant, bitter taste, but this can be removed at least cost by bulk processing. When soybean curd is made in the typical way, “many nutritious components are lost,” yet it is easy to digest. Soy sauce can be used only as a condiment because of its high salt content. Germinated soybeans make an excellent vegetable, which is rich in vitamin C).

Table 10-1 (p. 300) shows utilization of soybean oil (in millions of pounds) (1947-49 to 1967). The columns are: Shortening (the largest use and steadily increasing), margarine, cooking, salad and other edible oils (No. 2), total for food uses, total nonfood uses.

Toasted soy protein (Made by General Mills, starting in Belmont, Iowa, and named Hi-Pro and Protein Plus. “The Belmont plant has been running at capacity to supply for American Civil Defense stockpiling of toasted soy protein”). MPF (Multi-Purpose Food) made by a joint venture between General Mills and the Meals for Millions foundation. Gelsol (the “first vegetable protein found to have gelling properties”). Promine (an edible soy protein). Fibroprotein (soy protein spun into filaments). Soybean oil (The initial purpose of the U.S. soybean crushing industry was to obtain oil. The residual meal was considered virtually useless).

Chapter 13, titled “The world food issue,” is about world hunger, which is “an ever-present specter for 2.3 billion people of the present world population of 3.4 billion.” These people are concentrated largely in warm parts of the globe. Also discusses “protein malnutrition” (the main problem) and the need for more animal protein. North America has an animal protein “intake nine times that of the Far East.” A section on “Plant milks” (p. 428-29), which are made from pulses and cereals, includes a subsection titled “Soybeans” which begins: “Soybeans form the basis of the most widely used and successful plant milks in China, Hong Kong, Indonesia, and the Philippines. Such milk has recently become available in Europe and the United States, primarily for clinical purposes”—for children allergic to the proteins in cows’ milk.

Notes: Many references, divided into English and non-English, books and papers, are given at the end of each chapter. Address: Michigan State Univ.

535. Iwadare, Shoji. 1968. Nihon-teki chôju-hô [Japanese methods for life extension]. Tokyo: Oobunsha. [Jap]\*



536. Hesseltine, C.W.; Wang, H.L. 1969. Oriental fermented foods made from soybeans. *USDA Agricultural Research Service*. ARS-74-50. p. 45-52. Feb. Proceedings of the Ninth Dry Bean Research Conference.

• **Summary:** Contents: Introduction. Koji. Shoyu or soy sauce. Miso. Hamanatto. Sufu. Tempeh. Natto. Idli. Conclusion. Flow sheets (without quantities of ingredients) show the basic process used in making the following foods: shoyu, miso, hamanatto, sufu (fermented tofu), and tempeh.

A photo taken in Aug. 1948 shows a miso plant in Tokyo, Japan, with large wooden vats in the foreground. A part of this plant was destroyed during World War II. Address: Northern Utilization Research and Development Div., USDA, Peoria, Illinois.

537. Ebine, Hideo; Sakano, Keichi. 1969. Nattô miso no shisaku [Production of miso from natto]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 24. p. 122-24. March. [7 ref. Jap; eng]

• **Summary:** Reprinted from *Miso no Kagaku to Gijutsu (Miso Science and Technology)*. No. 173. p. 23-25 (1968). Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

538. Ohta, Teruo. 1969. Nattô [Natto]. *Shokuryo: Sono Kagaku to Gijutsu (Food: Its Science and Technology)* No. 12. p. 20-36. March. [Jap]  
Address: National Food Research Inst., Tokyo, Japan.

539. Saio, Kyoko; Watanabe, Tokuji. 1969. Daizu shokuhin no bisai kôzô [Observation of soybean foods under electron microscope]. *Shokuryo Kenkyujo Kenkyu Hokoku (Report of the Food Research Institute)* No. 24. p. 112-18. March. [8 ref. Jap; eng]

• **Summary:** Photos show 15 different electron microscope pictures including raw (dry) soybeans, soaked soybeans, steamed soybeans, natto, tofu, and frozen tofu. Reprinted from *Nihon Shokuhin Kogyo Gakkai Shi (J. of Food Science and Technology)* 15(7):290-96 (1968). Address: Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo, Japan.

540. Binding, George J. 1969. The soya bean—a vegetable full of body-building protein. *British Vegetarian*. March/April. p. 155-57.

• **Summary:** The “soya bean has the highest protein content of any vegetable. As such it is God’s gift to man and is a must for vegetarians. In the Far East it is known as ‘the meat of the soil.’” The author spent many years in East Asia, where he studied the foods of the region. Soya beans can be used to make a wide variety of foods; the author briefly describes the following: Bean shoots [soy sprouts], soya bean milk, bean curd or vegetable cheese [tofu], yuba, natto, miso, soy sauce, and boiled whole soybeans.

Since World War II, America has become the largest producer of soya beans. Before that war, England was one of the largest importers of soya beans in the world. “All vegetarians should make certain of a sufficient daily intake of protein. There’s no more effective and satisfying way of doing so than eating soya beans.” Address: M.B.E.

541. Stanton, W.R.; Wallbridge, A. 1969. Fermented food processes. *Process Biochemistry* 4(4):45-51. April. [34 ref]  
• **Summary:** “Fermentation of starch tubers such as cassava with fungal organisms such as *Rhizopus* can result in a food product with significant increases in protein content.” The cassava dough is inoculated then extruded (like noodles) into fermentation trays.

Table 1 shows many different “vegetable cheeses and related fermented foods.” The first such food mentioned is minchin, made from wheat [gluten] in China. The microorganisms used are *Paecilomyces*, *Aspergillus*, *Cladosporium*, *Fusarium*, *Syncephalastrum*, *Penicillium*, and *Trichothecium* species. This is an anaerobic fermentation of wheat gluten for 2-3 weeks at room temperature during the winter, with 10% salt added. The product is cut into strips and used as a condiment. Eaten as a meat substitute, it is rich in protein, nutritious, and healthy.

Fermented soy products include sufu, tempeh, meitauza, Hamanatto, shoyu, miso, and natto. Address: 1. PhD, Head, Microbiology Section, Tropical Products Inst., London, England; 2. Parke Davis Co.

542. Watanabe, Tokuji. 1969. Industrial production of soybean foods in Japan. Paper presented at United Nations Industrial Development Organization Expert Group Meeting on Soya Bean Processing and Use. 38 p. Document: ID/WG.45/3. Held 17-21 Nov. 1969 at Peoria, Illinois. [16 ref]  
• **Summary:** Contents: Tofu and its industrial production: Process of tofu making, tofu production as an industry, equipment for tofu production, varieties of tofu, new materials of tofu, new types of tofu, aburage and other deep fried tofu.

Kori-tofu and its industrial production: Process of kori-tofu making, kori-tofu production as an industry, equipment for kori-tofu production, distribution of kori-tofu, utilization of by-products.

Yuba and its industrial production.

Kinako [roasted whole soy flour] and its industrial production. The Japanese word can be written either in hiragana or using two Chinese characters which mean “yellow flour.” Kinako is made from whole soybeans. Sometimes the soybean hulls are removed before roasting. It is widely used as an ingredient in Japanese confections [such as kinako mochi or Abekawa mochi (toasted mochi in kinako)]; it was traditionally sold along the banks of the Abekawa River in Shizuoka, Japan]. About 12,000 metric tons of soybeans are used per year in making kinako.

New soybean food materials and their industrial production: New soybean food materials, usage of new soybean food materials, future of new soybean foods, other food uses of soybeans.

Natto and its industrial production: Process of natto making, equipment for natto production, natto production as an industry.

Miso and its industrial production: Varieties of miso, Process of miso making, miso production as an industry, industrialization of miso making, distribution of miso, future prospect of demand for miso, mycotoxins and fermented soybean foods.

Shoyu and its industrial production: Process of shoyu making, shoyu production as an industry, nitrogen utilization ratio in shoyu making, special shoyu.

Figures show: (1) Flow sheets of production of traditional soybean foods in Japan: Tofu, kori-tofu, yuba, kinako, natto, miso (with koji), shoyu. (2) NK-type soybean cooker (by courtesy of Kikkoman Shoyu Co. Ltd.). (capacity: 1 metric ton of defatted soybean meal). (3) (3) Continuous cooker of soybean meal (by courtesy of Yamasa Shoyu Co. Ltd.). (capacity: 1 metric ton of defatted soybean meal per hour).

Photos show: (1) Tofu soaked in water for sale. (2) Large-scale tofu factory (by courtesy of Tokyo Tofu Co., Ltd.). (3) Continuous cooker of ground soybeans (by courtesy of Masuko Sangyo Co., Ltd.). (4) Decanter, a kind of continuous centrifuge (by courtesy of Kokusan Seiko Co., Ltd). (capacity: 3,000 kg of ground soybeans per hour). (5) Factory of packed tofu from spray-dried soybean milk (by courtesy of Nippon Tanpaku Kogyo Co., Ltd.). (6) Continuous deep-fryer of aburage (by courtesy of Iwase Tekkosho Co., Ltd). (capacity: 1,000 to 1,500 pieces per hour). (7). Daiya Kori-tofu (Left one in the dish is swollen by hot water). (8) Bird's-eye view of large scale factory of kori-tofu (by courtesy of Misuzu Tofu Co., Ltd). (capacity: 10 to 15 metric tons of soybeans per day). (9) Soaking of large cake of tofu for precooling during making of kori-tofu (by courtesy of Misuzu Tofu Co., Ltd). (10) Continuous freezing equipment used in making of kori-tofu (by courtesy of Misuzu Tofu Co., Ltd). (11) Continuous thawing apparatus of frozen tofu (by courtesy of Misuzu Tofu Co., Ltd). (capacity: 10,000 to 15,000 pieces per hour). (12) Yuba plant (by courtesy of Ohara Co., Ltd). (13) Natto mixed up by chopsticks. (14) Inside of fermentation room for natto making (by courtesy of Suzuyo Kogyo Co., Ltd). (15) Two brands and varieties of miso, both in plastic bag and on dish. (16) Rotary cooker of soybean (by courtesy of Hinode Miso Co., Ltd). (capacity: 1 metric ton of soybeans). (17) Continuous rice cooker (by courtesy of Hinode Miso Co., Ltd). (capacity: 1.5 metric tons of rice per hour). (18) Rotary koji fermenter (by courtesy of Miyasaka Miso Co., Ltd). (capacity: 1.8 metric tons of rice in each fermenter). (19) Pasteurizer of miso (by courtesy of Nagata Machinery

Co., Ltd). (capacity: 1 metric ton of miso per hour). (20) Fermentation tank of moromi [mash] (by courtesy of Kikkoman Shoyu Co., Ltd). (capacity: 1.5 metric tons of rice per hour). (21) Shoyu in large glass bottle and smaller plastic container. (22) (22) Large-scale koji fermenter (by courtesy of Yamasa Shoyu Co., Ltd).

Concerning natto: The surface of each natto "soybean is covered with a viscous sticky substance, which has the property of forming long stringy threads when mixed up (Photo 13). The longer the strings, the better the quality of natto." The texture of the cooked soybeans is softened by the enzymes of *Bacillus natto*. About 50,000 metric tons of soybeans are used each year to make natto. It is most popular in northeastern Japan (Tohoku region). Natto is fairly perishable, and excess ammonia will be produced by overfermentation. There are about 1,300 plants that make natto in Japan; the average plant consumes about 100 kg/day of soybeans. Recently, however, large, mechanized factories that consume 2-3 metric tons/day of soybeans have been constructed. From 10 kg of whole dry soybeans about 18 kg of natto can be made. One package of natto containing 100 gm costs 15-20 yen (about 4-6 cents U.S.).

Note: This is the earliest English-language document seen (Jan. 2012) that uses the word "sticky" to describe natto. Address: Food and Nutrition Div., Food Research Inst., Ministry of Agriculture & Forestry, Tokyo, Japan.

543. Hesseltine, C.W.; Wang, H.L. 1969. Fermented soybean foods. In: Proceedings of the Third International Conference on Global Impacts of Applied Microbiology. See p. 403-20. Held 7-14 Dec. 1969 at Bombay, India. [11 ref]

• **Summary:** Contents: Introduction: The three fundamental drives of man (food, shelter, reproduction), benefits of soybean fermentation. Sufu. Hamanatto. Natto. Tempeh. Magou (now made in South Africa on a modern industrial scale from fermented corn and soybeans). Address: Northern Utilization Research and Development Div., USDA, Peoria, Illinois.

544. Fujita, Mitsuo; Yoshikawa, Yôzô. 1969. Nattô no bitamin B-2 seisei to ryûsan ion no shôchô [Vitamin B-2 production and the rise and fall of sulfate ions in natto]. *Mimasaka Joshi Daigaku Kiyô* No. 2. p. 64-72. [Jap]\*

545. **Product Name:** Natto.

**Manufacturer's Name:** Iwamoto Natto Factory.

**Manufacturer's Address:** 143-D Lower Paia, Paia, Maui, Hawaii 96779.

**Date of Introduction:** 1969.

**New Product-Documentation:** Hawaii Directory of Manufacturers. 1969. p. 17. "Fermented soybeans."

546. Omata, S.; Murao, S.; Imamori, C.; Urakami, C.; Tanaka, Y.; Jono, A.; Morito, H.; Ueno, T. 1969. Effects

of “Co gamma-rays” on natto preparation and *Bacillus natto*. *Osaka Furitsu Daigaku Kiyô (Nogaku Seibutsugaku) (Bulletin of University of Osaka Prefecture, Series B, Agriculture and Biology)* 21:61-76. (Chem. Abst. 72:41954. 1970). \*

• **Summary:** Most articles are in English.

547. Tanegashima, C.; Odera, N. 1969. [Nicotinic acid during natto processing. IV.]. *Mukogawa Joshi Daigaku Kiyô. Seikatsu Kagaku-hen (Scientific Reports of Mukogawa Women's Univ.–Domestic Science Series)* 17:75-78. [Jap]\*

548. Yoshikawa, Yôzô; Fujita, Mitsuo. 1969. Nattô no nenshitsu-buttsu ni kansuru kenkyû [A study of the viscous substances in natto]. *Mimasaka Joshi Daigaku Kiyô* No. 2. p. 73-78. [Jap]\*

549. Cowan, J.C. 1969. Soybeans. In: *Encyclopedia of Chemical Technology*. Vol. 18. 2nd ed. New York: John Wiley & Sons (Interscience Publishers). See p. 599-614. 27 cm. [44 ref]

• **Summary:** Contents: Introduction: Composition, standards and trading rules. Handling and storage. Processing: Preparation, screw-press and extruder-cooker operations, solvent extraction. Soybean products: Oil, meal and meal products, soy flour and related products, soy sauce and other food specialties (soybean milk, tofu, miso, natto, tempeh, sprouted soybeans, green vegetable soybeans). Production and export. Bibliography.

“An estimated 50 million lb of soy flour was marketed in 1967. About one-half of this went into pet foods and the rest into foods for humans.” Address: USDA.

550. Kusano, Aiko. 1969. Nattô seizô katei ni okeru daizu tanpaku no henka. I. Sô-chisso, suiyô-sei chisso, TCA kayô-sei chisso, amino-tai chisso, pepuchido-tai chisso ni tsuite [Changes in soybean protein during natto production. I. On the total nitrogen, water soluble nitrogen, TCA soluble nitrogen, amino nitrogen, and peptide nitrogen]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 22(9):615-20. [9 ref. Jap]

• **Summary:** Three kinds of natto were prepared using 3 different strains of *Bacillus natto*. Likewise a liquid natto was made from steamed soybeans, fermented under aeration and crushing. In regular natto water soluble nitrogen decreased to 85% of that in raw soybeans. TCA soluble nitrogen, amino nitrogen, and peptide nitrogen increased significantly in natto and their proportions differed in the natto made from two strains of *Bacillus natto*. Note: TCA is probably trichloroacetic acid. Address: Gifu Daigaku, Kyôiku-bu (Dep. of Education, Gifu Univ.).

551. Saito, Akio. 1969. [Chronology of soybeans in Japan, 1950 to 1969] (Document part). In: Akio Saito. 1985. *Daizu*

Geppo (Soybean Monthly News). Feb. p. 15-16. [Jap]

• **Summary:** 1950—The production of soybeans increases greatly to 446,900 tonnes (2.1 times more than in recent years).

1950—In March, the food ration system organization is closed. In July the ration systems for miso and shoyu are removed.

1951 March—The restrictions for soybeans and rapeseed are removed. From this time on, the number of natto makers increases rapidly.

1952—Soybean production in Japan reaches 521,500 tonnes, the largest since World War II.

1953 Jan.—Restrictions are imposed on imports of foreign soybeans paid for in foreign currencies.

1955. Rice production in Japan this year is 12,390,000 tonnes (up 35.9% over last year). This is the first time it has topped 12,000,000 tonnes. Irrigated rice cultivation (*suiden*) is 20% more than last year. The days of rice shortages are over and the black-market price of rice falls. The per-capita direct consumption of soybeans for the year is 4.5 kg (This information comes from *Norin Suisan-sho, Shokuryo Jukyuhô*).

1955 April—Soybeans from Brazil are graded using the AA system (*Yunyu jido shonin sei*).

1956—A new natto container is invented, made of shaved wood (*kyôgi*) lined with a polyethylene sheet.

1956 June 13—New regulations for agricultural products and price stabilization. Domestic soybeans are added to them.

1956 Oct.—The tax on imported soybeans rises to 10% and the no-tax system for soybeans is removed.

1959—The first instant miso soup is introduced by Yamajirushi Miso in Nagano. It contains dried green onions, wakame, dried tofu [probably dried-frozen tofu], etc.

1959—At about this time research begins on meat analogs made from soy protein.

1960—Per capita consumption of shoyu drops to 13.7 kg. It has now fallen below 14 kg/person.

1960—Soybean imports rise to 1,128,000 topping the 1,000,000 level of the first time.

1961 July 1—The tax on imported soybeans is removed.

1962—A new natto container made of Styrofoam is invented (*PHP yoki, happo suchiroru*).

1963—In the USA General Mills starts to sell meat analogs made from soy protein.

1965—Per capita miso consumption drops to 7.8 kg, falling below 8 kg/person.

1965—Production of defatted soybean meal reaches 1,074,000 tonnes, passing the 1 million tonne mark for the first time. Production has risen 56% in during the past 5 years.

1966—At about this time meat analogs based on soy protein start to be sold commercially in Japan—to institutions.

1966—Soybean imports rise to 2,168,467 tonnes, passing

the 2 million tonne mark for the first time.

1966–Production of soybeans in Japan drops below 200,000 tonnes for the first time. Japan now produces only 9% of the soybeans it consumes.

1966 May–Kikkoman starts selling low-salt shoyu.

1968–Meat analogs based on soy protein start to be sold to the general public in Japan.

1968 June–Research conducted by the *Mainichi Shinbun* shows that the size and price of tofu is now different in different areas. In Tokyo it sells for 25 yen per 300 gm or over. Cakes of tofu sold in downtown Tokyo (*shitamachi*) are smaller than those sold uptown (in the hilly sections) (*yamanote*). Some tofu shops that are not members of the tofu association sell it for 15 yen per 350 gm. In Nagoya it retails for 30 yen per 450 gm, and in Northern Kyushu 25 yen per 450 gm. Per capita consumption of tofu is 33 cakes (*cho*) a year.

1969–Per capita consumption of soy oil in Japan rises to 3.2 kg, passing the 3 kg mark for the first time. In 1969 it was 1.2 kg/person. Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

552. Steinberg, Raphael. 1969. *The cooking of Japan*. New York, NY: Time-Life Books. 208 p. Illust. General index. Recipe index (English). Recipe index (Japanese). 28 cm.  
 • **Summary:** A superb, elegant book, that (with its spiral-bound companion volume of recipes) captures in both words and photos (by Eliot Elisfon) the true spirit of Japanese food and cookery. Contents: Introduction: Solving the mysteries of Japan's marvelous cuisine, by Faubion Bowers. 1. The heritage of a remarkable past. 2. Foods to suit the seasons. 3. The logic of Japanese cookery. 4. The world's greatest seafood. 5. Simple, satisfying foods of home. 6. A ceremony that sired a cuisine (*kaiseki* or tea ceremony cooking, with roots in 13th century Zen Buddhism). 7. Eating out as a way of life. 8. Magnificent meals in elegant settings.

Soy-related: The writer of the introduction snacked on odorous, fermented soy beans (*natto*) at night before retiring (p. 6). His son said to him recently, "Please, Dad. Not *tofu* again!" (p. 7). Importance of the soybean (p. 16-17; China has had a huge impact on Japanese culture. "Perhaps the most important food innovation contributed by China was the soybean, which in various disguises is still the foundation stone of Japanese cooking."). Shoyu is the Japanese word for soy sauce (p. 26). Tofu (soybean curd), which is cooked with other foods throughout most of the year, becomes a dish in its own right during the summer, served on ice and flavored with soy sauce (as *hiyayakko*, p. 32). Photos of tofu, shoyu, green soybeans [*edamame*] and akadashi miso in prepared festival dishes (p. 34-35). *Matsutake* mushrooms with tofu or shoyu. "The most important lesson to be learned deals with the ubiquitous role of the soybean. Generally considered by Westerners to be the most humble of vegetables, the soybean is in fact the king of the Japanese kitchen. One might almost

say that Japanese cuisine is built upon a tripod of soybean products: *miso*, a fermented soybean paste; *tofu*, a custardlike soybean cake; and soy sauce, used both to season foods as they are being cooked and to make dipping mixtures that enhance the flavors of the foods as they are being eaten." Details about these three products and their uses is then given (p. 41-42). Teriyaki or "shining broil" (p. 43). Two-page color photo shows (p. 44-45): Azuki beans and *kuromame* (black soybeans), sesame seeds, sesame oil, *fu* (wheat gluten croutons), *aonoriko* (powdered green seaweed), Kikkoman shoyu, *aka miso*, *shiro miso*, *tofu*, nori and wakame. Ponzu, a dipping sauce which is half soy sauce and half lemon or lime juice (p. 46). Sukiyaki (p. 46). Tempura (p. 49). *Aemono* and *sunomono* with tofu, miso, or soy sauce (p. 48). Photo of a tofu-slicing knife with a serrated blade (p. 50). Recipes: Clear soup with tofu and shrimp (*Sumashi wan*, p. 55). Miso soup with red and white miso (p. 56-57, 59). Miso-flavored pork and vegetable stew (*Satsuma-jiru*, p. 61). Soy and sesame-seed dressing with string beans (*Goma joyu-ae*, p. 62; with "½ cup white sesame seeds, toasted and ground to a paste"). Tofu and sesame-seed dressing with vegetables (*Shira-ae*, p. 63; "Add the sesame seeds..., warm them until lightly toasted. Grind them to a paste in a *suribachi* (serrated mixing bowl) or, more easily, pulverize them at high speed in an electric blender with 1/8 teaspoon of soy sauce. Transfer the sesame-seed paste to a mixing bowl...") Two color photos show: (1) Toasted sesame seeds in a *suribachi* with a wooden pestle. (2) When ground, they "quickly release their oil and turn into a paste". White miso dressing (*Neri shiro miso*, p. 67). Photo of *zensai*, incl. miso-marinated asparagus, and abalone cooked in soy sauce (p. 72). Sashimi dipped in soy sauce (p. 81-83, 90-91).

Undersea vegetables: nori, kombu, wakame, hijiki (p. 88-89). Recipes: Sushi (p. 95-101). Tempura (p. 103). Mirin and soy dipping sauce for tempura and noodles (*Soba tsuyu*, p. 104). Deep-fried tofu in soy-seasoned sauce (*Agedashi*, p. 105).

Tofu is the Japanese word for soybean curd (p. 108). Umeboshi (p. 109). Miso soup (p. 109-10). Natto and miso (p. 115). Tofu and shoyu in *yudofu* (p. 116). Sekihan and azuki (red beans, p. 120). *Mame* ("beans") are served at traditional wedding feasts; the word also means good health. Mochi (p. 121). Recipes: Sekihan (p. 126). Fox noodles with deep-fried tofu (*Kitsune udon*, p. 127). Bubbling tofu (*Yudofu*, p. 132-33). *Sukiyaki* (p. 134, with tofu and soy sauce). *Shabu shabu* (with tofu, p. 135).

Tofu and miso in *kaiseki* cuisine based on Zen Buddhism and the tea ceremony (p. 146-49). Teriyaki, mirin, ponzu, tofu (p. 152). Tofu and shoyu (p. 159). Sasanoyuki restaurant in Tokyo (uses tofu as a main ingredient in every dish, p. 160-61). Sukiyaki, with tofu and soy sauce (photo, p. 166-67). Broiled mackerel in miso marinade (*Miso zuke*, p. 169). Dengaku tofu (p. 172-73, with color photo). Beef teriyaki (with shoyu, p. 174-75). Yakitori (with teriyaki sauce, p.

174-75). Grilled chicken with sweet soy-seasoned glaze (*Tori teriyaki*, p. 176). Black soybeans and tofu (p. 188). At a geisha house, shoyu is called *murasaki* (“the purple”).

A guide to Japanese ingredients (glossary): Incl. ajino-moto, aonoriko, azuki, fu, goma, goma-abura, hichimi (shichimi) togarashi, kombu, konnyaku, mirin, miso, MSG, nori, shoyu, soba, tofu, umeboshi, wakame, wasabi.

Note: The spiral-bound recipe book accompanying this volume contains the recipes in the parent volume and no new information; the binding makes it easier to use in the kitchen. Address: USA.

553. Centre de Documentation Internationale des Industries Utilisatrices de Produits Agricoles (CDIUPA). 1970--. IALINE (Industries Agro-Alimentaires en Ligne) base de données [IALINE (Food and Agricultural Industries On-Line) database]. 1, avenue des Olympiades-91300 Massy, France. [271542 ref. Fre]

• **Summary:** This is the world’s best database for French-language publications related to food and nutrition. It first became available for use in Jan. 1970, and that is also the date of the earliest record in the database. It is produced by the Center for International Documentation on Industrial Utilization of Agricultural Products (CDIUPA), founded in 1965 by the French Ministry of Agriculture. CDIUPA is administered by APRIA (*Association pour la Promotion Industrie Agricole*), which is a member of the International Commission of Agricultural and Food Industries.

The current contents of the database is published in a monthly journal titled “Industries Agro-Alimentaires: Bibliographie Internationale,” which began under that title in Jan. 1983. It was preceded by *Bibliographie Internationale des Industries Agro-Alimentaires. Bulletin Bibliographique* (published from Jan. 1967 to Dec. 1982). In the monthly journal, the citations are grouped under 6 broad headings: 1. General (with 8 subcategories). 2. Agro-food industries (industries agroalimentaires; with 17 subcategories; Many documents on soyfoods are cited in subcategory N titled “*Protéines d’origine animale, végétale, microbiologique, algues et levures aliments*”). 3. Fermentation industries (with 6 subcategories). 4. Food microbiology. 5. Food toxicology. 6. Utilization and adding value to agricultural and food-industry by-products. Biotechnology. The journal contains 3 indexes: Subject index. Index of sources (periodicals [with journal names written out in full], acts of congress, books, theses). Author index.

Information related to soyfoods is likely to be found under the following headings in the subject index: *Aspergillus oryzae*; Farine de soja (incl. soy flour, and roasted soy flour or kinako); Huile de soja (soy oil); Koji; Lait de soja (soymilk); Miso; Nato (incl. natto); Produit à base de soja (incl. dawa-dawa, kinema, soy cheese [western style], fermented black soybeans / Hamanatto, soynuts, soy ice cream, soy yogurt, thua-nao, yuba), Protéine de soja (soy

protein products); Protéine de soja, Produit extrudé (extruded soy products); Protéines d’origine animale, végétale; Sauce de soja (soy sauce); Soja (incl. green vegetable soybeans); Soja, germe (soy sprouts); Sufu (fermented tofu); Tempeh; Tofu. Address: Massy, France. Phone: (1) 69.20.97.38.

554. Hongo, Motoyoshi; Yoshimoto, Akihiro. 1970. Bacteriophages of *Bacillus natto*. Part II. Induction of gamma-polyglutamic acid depolymerase following phage infection. *Agricultural and Biological Chemistry* 34(7):1047-54. July. [22 ref]

• **Summary:** “A depolymerase capable of decomposing gamma-polyglutamic acid was formed when *Bacillus natto* was infected with bacteriophages.”

Note: A bacteriophage (from ‘bacteria’ and Greek verb *phagein* meaning “to eat”) is any one of a number of viruses that infect bacteria. The term is commonly used in its shortened form, phage (Source: Wikipedia). Address: Lab. of Applied Microbiology, Dep. of Agricultural Chemistry, Kyushu Univ., Fukuoka, Japan.

555. Hongo, Motoyoshi; Yoshimoto, Akihiro. 1970. Bacteriophages of *Bacillus natto*. Part III. Action of phage-induced gamma-polyglutamic acid and the enzymatic hydrolyzates. *Agricultural and Biological Chemistry* 34(7):1055-63. July. [9 ref. Eng]

• **Summary:** “Phage-induced gamma-polyglutamic acid depolymerase was purified about 1000 fold by Sephadex G-75 and DEAE-cellulose column chromatographies and Sephadex G-200 gel filtration.” Address: Lab. of Applied Microbiology, Dep. of Agricultural Chemistry, Kyushu Univ., Fukuoka, Japan.

556. Wenkam, Nao S.; Wolff, Robert J. 1970. A half century of changing food habits among Japanese in Hawaii. *J. of the American Dietetic Association* 57(6):29-32. July. [15 ref]

• **Summary:** In about 1885, a predominantly vegetarian diet was representative of the farming and laboring classes in Japan. “The three great staples were rice, barley, and soybeans.” Those who could not afford rice consumed a less expensive grain such as millet, wheat, barley, buckwheat, or even sweet potatoes. Legumes, which were used universally, included soybean products, peas, mung beans and azuki. The main soybean products were tofu, miso, natto, aburage, and shoyu. Other foods in general use included daikon radish, several types of cabbage, marine algae such as nori, konbu, wakame. etc.

“According to statistics for 1880, total plant food consumption was proportioned as follows: rice, 53 per cent; barley and wheat, 27 per cent; tubers and vegetables, 6 per cent; fruits and algae, less than 1 per cent.”

“The chief animal food was fish, much used near the sea, less in the interior. Poultry and eggs were used in small amounts. Beef, mutton, pork, milk, and butter formed a

minor part of the diet. The amounts of animal food available per capita per year in 1900 were: meats, 1.3 lb.; fresh fish, 27 lb.; dried fish, 2.5 lb.; and imported meats and fish, 0.3 lb.”

A bar chart shows that the daily intake of protein for Japanese adults in Japan and Hawaii has increased from 62 gm in the late 19th century to 101 gm today—an increase of 63%. During the same period, daily fat intake has increased from 10 gm to 87 gm—an 8.7-fold increase! Calories per day are about the same. Address: Dep. of Food and Nutritional Sciences, and School of Public Health, Univ. of Hawaii, Honolulu.

557. *Los Angeles Times*. 1970. Mastering the menu: Learn how to order your Kaffee mit Schlagobers. Oct. 2. p. I2.

• **Summary:** For each of 15 countries where Americans travel, gives a list of words that are useful when ordering in a restaurant. Under Japan: “Kabayaki: Broiled eels. Miso: Bean paste [soy]. Natto: Steamed and fermented [soy] bean. Sashimi: Raw fish dish... Shoyu: Soy sauce. Soba: Buckwheat noodles. Sukiyaki: A quick-cooked meat stew [with tofu and shoyu]. Sushi: Flavored rice and raw fish [sic, many kinds without raw fish]. Tempura: Deep-fried shrimp, fish and vegetables. Tofu: Bean curd. Unagi: Eel.”

Note: This same article appeared under the title “Are menus a puzzle? Master a few of those foreign food phrases” in the Oct. 6 issue (p. F16) of this newspaper.

558. Yoshimoto, Akihiro; Nomura, Sigeyuki; Hongo, Motoyoshi. 1970. [Bacteriophages of *Bacillus natto*. IV. Natto plant pollution by bacteriophages]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 48(11):660-68. Nov. [11 ref. Jap; eng]

Address: Lab. of Applied Microbiology, Dep. of Agricultural Chemistry, Kyushu Univ., Fukuoka, Japan.

559. Wang, H.L.; Hesseltine, C.W. 1970. Oriental fermented foods. Paper presented at Part I, Seminar on Protein Food Promotion. 5 p. Typed manuscript. Held Nov. 22 to Dec. 1, 1970 at Inst. of Food Research and Product Development, Kasetsart Univ., Bangkok, Thailand. [13 ref]

• **Summary:** Contents: Introduction. Miso. Hamanatto. Sufu. Natto. Tempeh. Nutritional value of fermented foods. Absence of aflatoxin in fermented food products.

A note on page 1 of this manuscript states: “To be published in Part I of Seminar on Protein Food Promotion, November 22-December 1, 1970, Institute of Food Research and Product Development, Bangkok, Thailand.” This was an invited paper. Address: NRRL, Peoria, Illinois.

560. Ebata, Okiei. 1970. Nattô-kin ni kansuru kenkyû [A study on natto microorganisms]. *Tokai Joshi Tandai Kiyo* No. 2. [Jap]\*

561. Abehsera, Michel. 1970. Cooking for life. Swan House,

P.O. Box 638, Binghamton, NY 13902. xiv + 364 p. First Avon Flare Books printing, March 1972. Index. 21cm.

• **Summary:** Contains many imaginative and joyous macrobiotic recipes. Acknowledgments: “This book could never have been completed without the help of my wife, Claude. Most of the recipes are hers; she cooked, tested and wrote them down... Jack Garvy completed the editing of the book and made definite English corrections. My exceptional friend William Dufty gave valuable advice. Finally, my brother Charles was very helpful...”

The author uses the term “black beans” and from his definition on page 18 it seems that he is referring to black soybeans: “Black Beans, twin brothers of the red aduki in size, are sold in Chinese, Japanese and natural-food stores. They are the milk and honey of the bean family, and their flavor and texture impart a delightful sweetness and richness to any soup or vegetable dish.” No definition is given of soybeans. In the section titled “Condiments” (p. 20-21), the author defines soya sauce, miso, seitan, salted plums, tofu, kuzu, etc. “Tofu is another name for soya-bean curd. In Chinatown, you’ll see it in wooden barrels. It looks like Feta Greek Cheese and some people would swear it tastes like chicken. It is excellent served with sauteed vegetables, sauces, fried or cooked in Miso Soup.

“Seitan: Your guests will almost certainly mistake this for meat. Teeth find it pleasant to chew. A combination of wheat gluten, wheat soya beans [sic], water and salt, it comes in handy when mixed with vegetables, sauces and soups.” Note 1. No recipe for making or using seitan appears in this book.

Soy-related recipes include: Cooking beans in a pressure-cooker (p. 66; “Do not pressure cook black beans. Their skins may come off and clog the pressure cooker spout. It is quite dangerous!”). Cooking beans in a pot (incl. soya beans, p. 67). Black-bean stew (with miso, p. 70). Soja jardiniere (with whole soya beans and miso).

In the chapter titled “Soups,” the author tells the story of how the famous Japanese physician, Dr. Tatsuichiro Akizuki, used miso to strengthen his constitution and to survive the atomic bomb dropped on Nagasaki on 9 Aug. 1945. Under “Minerals” in that chapter he discusses other virtues possessed by miso, then gives a recipe for Miso soup (p. 86).

Radishes sauteed in miso (p. 114). Sandwich au gratin (with miso spread, p. 114). Macrobiotic marbles (with miso, p. 155). Claudia’s pizza (with miso, p. 158). Salade au cresson (with miso, p. 169). Nato [sic, Natto] (Japanese salad with natto, p. 171; Note 2. The author describes “Nato” as “sour soy-beans, bought in a Japanese store”). Miso sauce (p. 178). Miso spread (with tahini, p. 187). Oat-miso spread (p. 188). Scallion spread (with miso, p. 188). Miso pâté (p. 189). Komoku (with tofu, deep-fried and cut into strips, p. 212). O’Sushi (with tofu, p. 217). Kasha à l’Orientale (with tofu, p. 220). Bi-Cuan (Vietnamese recipe with fried tofu, p. 226). Kageitsu ice cream (with fine soya powder [perhaps Jolly

Joan from Ener-G foods in Seattle], p. 334; “Kagetsu is a beautiful restaurant in Seattle”). Yellow pompidou (with soya bean powder, p. 336).

The Foreword states (p. 1-2): “Ten years ago I was a sick man, struggling to stay alive and to finish a novel. I suspected I might fail in both matters and the doctors of Paris agreed. They abandoned me as a hopeless case. It was then that I discovered a way of life called Macrobiotics. After a year of eating grains and vegetables, my health restored, I ventured to New York to discover America and finish my novel.”

Note 3. *Webster’s Dictionary* (1985) defines feta, a word first used in English in 1940, as “a white semisoft Greek cheese made from sheep’s or goat’s milk and cured in brine.”

Fax from Jimmy Silver. 1991. Dec. 17. This was the first best-selling macro / natural food cookbook. Michel is head of a (the?) Jewish community in Montreal, Canada. He has 7-9 brothers and 1 sister. “His brother, George, founded the Nature de France clay based body care company—originally called Cattier but changed after they were sued by Cartier. I thought they would have prevailed in the suit but George didn’t want to spend \$500,000 to fight it even if he won.” Address: New York.

562. Binding, George Joseph. 1970. About soya beans: Wonder source of protein and energy. London: Thorsons Publishers Ltd. 64 p. No index. 18 cm. About series, no. 35. • **Summary:** Contents: 1. Beans in general. 2. History of the soya bean. 3. Content of soya beans. 4. About lecithin—vital for retaining youth. 5. The soya bean in the Far East: La Choy Products, cooking in China, soya sauce, bean curd or tufu [sic, tofu], bean sprouts, soya bean milk, candied beans, Japan, natto, miso, Japanese soya sauce. 6. American influence on the soya bean. 7. Industrial uses in America. 8. The soya bean and world food shortage. 9. Soya bean recipes.

On page 10 we read: “For over 5,000 years this tiny seed has been the staple food of certain parts of the East, including North China, Japan, Korea, and some areas of India. The ancient Yogis, who were among the world’s first vegetarians, placed great faith in the soya bean as a supplement to their meatless diet.” Note: Soyfoods Center has been unable (Aug. 2004) to find any documentation for the statement that the ancient yogis consumed soya beans. The earliest date we have seen (Aug. 2004) for the soybean growing in India is 1798 (Roxburgh 1832). The earliest document we have seen concerning the soybean in India is by Beckmann (1798). The earliest document seen (Aug. 2004) for soy products in India (soy sauce) is by Locke (1679). Address: England.

563. Shokuhin daijiten [Great Japanese encyclopedia of foods]. 1970. Tokyo. [Jap] • **Summary:** Contains entries for amazake, miso, natto, shoyu, and tofu.

564. Sundhagul, Malee; Smanmathurapoj, Puangpen; Bhodhacharoen, Wanchern. 1970. Thua-nao: A fermented soybean food of northern Thailand. I. Traditional processing method. Bangkok: Applied Scientific Research Corp. of Thailand (ASRCT). 14 leaves. Traditional Processing Method, Research Project No. 38/3. 30 cm. [8 ref] • **Summary:** Contents: Summary. Introduction. Materials and methods: Microbiological methods. Results and discussions. Microbiology of natural fermentation. Keeping quality of thua-nao. Chemical composition and nutritional value. Conclusions.

This study is part of the Research Project No. 38/3 (Soybean protein preparations), which aims at developing processes for making soybean, which is a high-protein source, more readily available in a stable and acceptable form in order to provide suitable material for protein food formulation.

Summary: The fermentation was found to be caused by Gram-positive spore-forming bacilli, *Bacillus subtilis*. Two strains were isolated. The product was prepared as dried chips to extend the shelf life.

During a study on the distribution and consumption of fermented fish in Thailand, it was learned that several villages in Northern Thailand, where fish is scarce, make a fermented soybean product called thua-nao, which is used like fermented fish. It adds flavor to vegetable soups and hot [spicy] dishes. In some areas the product had become an article of diet in its own right, not merely a flavoring agent.

Thua-nao was prepared by researchers as follows: Cook whole dry soybeans in boiling water for 3 hours, then drain. Weigh 40 gm into various petri dishes and autoclave for 40 minutes. Cool to room temperature, then inoculate with a pure culture of the bacteria. Incubate at 35°C for 48 hours.

In Thailand, thua-nao is prepared and consumed mostly in Lampang and Lamphun, two northern provinces. The following method is used. Wash 1-2 kg of whole dry soybeans in clean water. Place in a large cooking pot with excess water and boil until thoroughly cooked—typically 3-4 hours. Add water during cooking if necessary to keep the water level well above that of the beans. The beans are considered cooked when they can be easily crushed between the fingers. Drain and transfer to a bamboo basket lined with banana leaves. Cover with additional banana leaves to prevent loss of moisture or mold contamination. Allow the beans to undergo natural fermentation at room temperature for 3-4 days until they are thoroughly soft in texture, and turn into a thick paste when lightly crushed between the fingers. They should be covered with a sticky, viscous, colorless material and accompanied by a pungent odor of ammonia. Fermented beans are considered spoiled if they are heavily contaminated with mold or if they give off a sour, rancid, or putrid smell, sometimes accompanied by a yellowish slimy material. Fermentation could be shortened to about 2 days

if the basket containing the cooked beans is placed in the sunlight during the day or kept in a warm place during the fermentation.

The characteristic beany flavor disappears after fermentation and the color of the soybeans changes from light brownish yellow to greyish brown. Over-fermentation of the beans results in much darkening of the beans which is considered a sign of poor quality. Under-fermentation results in a product which is too hard.

After fermentation the thua-nao is mashed lightly into a paste. Salt and, sometimes, other flavoring agents such as garlic, onion, and red chili peppers are ground into the paste. Small portions of the paste are then individually wrapped in banana leaves. These are cooked (either by steaming at atmospheric pressure or roasting over an open fire) before selling or eating.

Cooked thua-nao paste can be kept for about 2 days under normal conditions. For longer storage: Form the thua-nao paste into small balls of 1-1½ inches in diameter. Press these to form thin chips, then sun-dry them. Dried chips may be kept for several months without spoilage. A flow sheet (p. 6) shows these two methods of traditional processing.

Analyses of raw fermented beans showed a mean bacterial count of 5.2 billion cells/gm, mean moisture content of 62.0%, and mean pH of 8.4. Seven different types of bacteria were isolated. Those responsible for the fermentation were *Bacillus subtilis*. Thus the product is closely related to Japanese natto.

Note 1. This is the earliest document seen (Jan. 2012) that mentions “thua-nao,” which is a close relative of Japanese natto.

Note 2. This is the earliest document seen (Jan. 2012) that uses the word “sticky” to describe thua-nao or any of the close relatives of Japanese natto. Address: Bio-Technology Group, Technological Research Inst., ASRCT, Bangkok, Thailand.

565. Joo, Hyune Kyu. 1971. [Studies on the manufacturing of chungkukjang]. *Hanguk Sikp'um Kwahakhoe Chi (Korean J. of Food Science and Technology)* 3(1):64-67. May. [19 ref. Kor; eng]

• **Summary:** Discusses *Bacillus subtilis*. Address: Dep. of Agricultural Chemistry, Agricultural College, Kon Kuk Univ.

566. Kosuge, Takuo; Zenda, Hiroshi; Tsuji, Kunio; Yamamoto, Takeshi; Narita, Hiroko. 1971. Studies on flavor components of foodstuffs. I. Distribution of tetramethylpyrazine in fermented foodstuffs. *Agricultural and Biological Chemistry* 35(5):693-96. May. [17 ref]

• **Summary:** Tetramethylpyrazine (T.M.P.) was detected in many Japanese fermented foodstuffs, especially miso (29 mcg/kg), natto (22), and soy sauce (4). Moreover, the amount of T.M.P. in miso increased almost tenfold (from 29 to 265 mcg/kg) after storage for 1 year. This fact indicates

that T.M.P. may play an important part in the flavor of these fermented foods. Roasted foods, such as coffee, cocoa, and peanuts, are a rich source of alkylpyrazines. Address: Shizuoka College of Pharmacy, Shizuoka, Japan.

567. Ohsawa, George. 1971. *Macrobiotics: An invitation to health and happiness*. Edited and appended by Herman Aihara. Oroville, California: George Ohsawa Macrobiotic Foundation. 95 p. Illust. 21 cm.

• **Summary:** Contents: Introduction. What is happiness? Judgment and health. Seven conditions of health. Foods for health and happiness. How to eat. Macrobiotic external treatment.

Appendixes (by Herman Aihara). A. History of macrobiotics. B. Warning of Diet No. 7. C. How to start macrobiotics. D. Macrobiotic cooking. E. Recipes (Cornellia Aihara). F. Does the macrobiotic diet supply enough protein. G. Vitamins. H. Conclusion: Eight macrobiotic principles, the Unifying Principle, the Order of the Universe.

Soy-related recipes include: Creamed onion-miso soup (p. 41). A table showing the amount of protein in various foods includes soybeans, soy sauce, natto, and miso.

Note: In his book *Learning from Salmon*, Herman Aihara says that this was his first book, published in June 1971. The copyright page says “Copyright 1971,” but the National Union Catalog seems to indicate that it was not copyrighted until 1976. The 6th printing was 1984.

568. Yoshimoto, Tadashi; Fukumoto, Juichiro; Tsuru, Daisuke. 1971. Studies on bacterial proteases: Some enzymatic and physicochemical properties of the alkaline protease from *Bacillus natto*. *International J. of Protein Research* 3(5):285-95. [28 ref. Eng]

• **Summary:** Various strains of *Bacillus natto* are known to produce proteolytic enzymes that have generally been classified into two groups: neutral and alkaline proteases.

An alkaline protease of the bacterium *Bacillus natto* strain Ns was purified and crystallized from aqueous solution. “The enzyme was most active at pH values between 10.3 and 10.8 toward casein substrate and completely inactivated by incubation with DFP... The fact that most strains of *Bacillus natto* so far investigated by us have also produced this type of protease suggests that *Bacillus natto* mainly secretes the alkaline protease belonging to the group of subtilisin type Carlsberg.” Address: Faculty of Science, Osaka City Univ., Sumiyoshi-ku, Osaka, Japan.

569. Kameda, Yukio; Sagai, H.; Yamada, T.; Kanatomo, S.; Matsui, K. 1971. Antitumor activity of *Bacillus natto*. II. Formation of cytolytic substances on Ehrlich ascites carcinoma in *Bacillus natto* KMD 1126. *Chemical and Pharmaceutical Bulletin* 19(12):2572-78. Dec. [10 ref]

• **Summary:** A culture medium suspension of *Bacillus natto* KMD 1126 had no significant cytolytic activity on Ehrlich



ascites carcinoma cells. "But when the bacterial suspension was preincubated in the buffer at 37°C for 2 hours, cytolytic substances were found outside the cells."

It was found that there are at least two kinds of substances in the preincubation mixture. One which had a high molecular weight, had cytolytic and hemolytic activities, whereas the other, which had low molecular weight, had only cytolytic activity. Address: Faculty of Pharmaceutical Sciences, Kanazawa Univ., 13-1 Takaramachi, Kanazawa, Japan.

570. Hayashi, Yoshio; Kawabata, Makoto; Taguchi, Kuniko. 1971. Nattô no nenshitsu-butsu ni kansuru kenkyû [A study of the viscous substances in natto]. *Kyoto Furitsu Daigaku Gakujutsu Hokoku, Rigaku, Seikatsu Kagaku (Kyoto Prefectural Univ., Scientific Reports: Natural Science and Life Science)* 22:13-17. (Chem. Abst. 76:110278y). [Jap]\*

• **Summary:** Natto mucilage is composed mainly of an acidic glycopeptide. 600 mg mucilage was obtained from 220 gm natto (100 gm soybeans). The chemical composition of the mucilage is: sugar 61.5%, hexosamines 2.8%, total nitrogen 4.1%, amino-nitrogen 2.9%, and uronic acid 20.4%. The constituent sugars of the mucilage are arabinose, xylose, rhamnose, galactose, glucose, glucosamine, and galactosamine. The peptide portion comprises 16% of the mucilage and 17 amino acids were liberated from the mucilage on hydrolysis. Address: Kyoto Prefectural Univ., Kyoto, Japan.

571. Park, K.T.; Sung, H.S. 1971. [Studies on the chung-kook-jang fermentation. I. Isolation and identification of the bacteria and selection of the best strains for chung-kook-jang]. *Misaengmul Hakhoe Chi (Korean J. of Microbiology)* 9:74-85. NattKCEt [Kor; eng]\*

• **Summary:** A total of 65 strains of bacteria were isolated from natural chung-kook-jang, Korean-style natto, in an incubator at 37°C; 37 strains were from sample K incubated enclosed in rice straw and 28 strains were from sample S from steamed soy beans only. In the first screening, 15 strains were selected for their superior protease activities; 8 strains from K and 7 strains from S. In the 2nd screening, conducted by taste panel tests from the first screening, No. K-27 and S-16 were selected as the best for chung kook jang. These two strains were classified and identified as a variation of *Bacillus subtilis* by Bergey's manual.

Note: This is the earliest document seen (March 2009) that mentions Korean-style natto, which it calls "chung-kook-jang" (in the English abstract). Address: National Industrial Research Institute, Korea.

572. Hesseltine, C.W.; Wang, H.L. 1971. Fermented soybean foods. In: Y.M. Freitas and F. Fernandes, eds. 1971. Global Impacts of Applied Microbiology, GIAM III. India: Univ. of Bombay. See p. 403-20. Conference held in 1969 in Bombay,

India. [11 ref]

• **Summary:** Contents: Introduction: Nine advantages of fermenting soybeans. Sufu. Hamanatto. Natto. Tempeh. Magou (from South Africa).

"In South Africa, an interesting fermented native food (*magou*) is now made on a modern industrial scale from fermented corn and soybeans. *Magou* is prepared by the fermentation of coarsely ground white corn meal (maize). Pure cultures of *Lactobacillus* used in this fermentation were isolated from native *magou*. The culture, which is not pure, is started in coarse whole wheat flour." Then it is used to ferment corn meal for 22-24 hours. "The mash from the fermentation tanks is mixed with defatted soybean meal, sugar, whey, or buttermilk powder and yeast. The soybean meals used contain at least 52 per cent protein. After thorough mixing of all the ingredients, the mix is spray dried. Currently this product sells for about 10 cents a pound in 50 pound bags... *Magou* is used principally for feeding miners and other workers employed in heavy industry. It is well adapted to being taken into the mines and reconstituted at the point of consumption." Address: NRRL, Peoria, Illinois.

573. Hirayama, Takeshi. 1971. Epidemiology of stomach cancer. In: Tadashige Murakami, ed. 1971. Early Gastric Cancer. Baltimore, Maryland: University Park Press. Gann Monograph on Cancer Research No. 11. viii + 301 p. See p. 3-19. (Tokyo: Tokyo Univ. Press). [18 ref]

• **Summary:** This paper outlines the results of an epidemiological case-control study of stomach cancer in Japan. Table 1 (p. 10) shows "Factors associated with the standardized death rate for stomach cancer in 46 prefectures in Japan." Many foods and nutritional elements are included. A negative association means: The more one consumes, the less one's risk of dying from stomach cancer in Japan. The author reported a significant negative association for tofu (-5.28), vitamin A (-4.12), and calcium (-6.54), and a very significant negative association for milk (-9.19). Thus these foods and nutrients appear to protect against stomach cancer. There was a significant positive association for fermented soybeans (+4.90; probably natto) and with a large amount of highly salted foods, including highly salted miso, but not including soy sauce or regular miso.

"The number of deaths from cancer of the stomach is still on the increase in Japan. Most of the increase, however, was found to be due to the increase in population itself. When the change in age structure was taken into account, the disease was noted to be on the downward trend since 1958. The death rate for age 45-49 in 1970 was 29% less for males and 14% less for females than in 1955." The standardized death rate from stomach cancer for men in Japan (68.57) was the highest in the world, and over 7 times higher than for U.S. whites (9.42). By marital status, widowed men have the highest rate (376.3), followed by separated men (273.6), then married men (116.4), with single men (75.1) having the

lowest rate.

“In an international survey of 24 countries, the decline in the death rate for stomach cancer in recent years was found to be closely correlated to milk consumption.” Address: Epidemiology Div., National Cancer Center Research Inst., Tsukiji 5-1-1, Chuo-ku, Tokyo, Japan 104.

574. Korean Society of Food Science and Technology. 1971. Comprehensive review of the literature on Korean foods (1917-1968). Seoul, South Korea: 71 p. \* Address: Korea.

575. Kusano, Aiko. 1971. Nattô seizô katei ni okeru daizu tanpaku no henka. II. TCA kayôsei kubun ni okeru zen amino-san, yûri amino-san pepuchido-tai amino-san ni tsuite [Changes in soybean protein during natto production. II. On the TCA soluble total and free amino acids in the TCA soluble fraction]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 24(1):8-12. (Chem. Abst. 75:87257). [4 ref. Jap] Address: Faculty of Pedagogy, Gifu Univ., Nagara Gifu City, Japan.

576. Tsuji, Kaichi. 1971. Kaiseki: Zen tastes in Japanese cooking. Tokyo and Palo Alto: Kodansha International Ltd. 207 p. With 96 color plates. Original woodcuts by Masakazu Kuwata. 29 cm.

• **Summary:** Contents: Foreword by Yasunari Kawabata (winner of the Nobel Prize for literature in 1968). Foreword: The tea ceremony and kaiseki by Sôshitsu Sen (head of the Urasenke School of Tea and the 15th generation descendent of Sen no Rikyu, founder of the school). Utensils and Kaiseki by Seizô Hayashiya (chief curator of the Ceramics Department at the Tokyo National Museum). The twelve months of kaiseki. The kaiseki courses (defines and describes each course, such as Mukôzuke, Misoshiru [pages 168-71 give a fine description of miso and miso soup], Wanmori, Yakimono, Azukebachi, Hassun, etc.). Postscript. Notes on utensils. List of recipes. Glossary: Includes descriptions of miso, natto (incl. *Daitokuji-nattô*, p. 66), shoyu, tofu, and yuba, plus azuki and Dainagon-azuki, many types of wheat gluten (fu), kuzu, mochi, sea vegetables (konbu, nori, wakame), fresh-water algae (Kamogawa-nori, Suizenji-nori [= Kotobuki-nori]), and umeboshi.

This is a magnificent, beautiful book, the finest work available on Japan's highest form of haute cuisine, Tea Ceremony Cuisine, by a great Japanese Kaiseki chef. It was first published in Japanese by Tan-kôsha Inc. of Kyoto. Soyfoods are used throughout the book—especially miso, since one of the fixed courses in a kaiseki meal is miso soup (*misoshiru*). Many recipes use soy sauce, often the light colored type, usukuchi. Most recipes are shown in an accompanying full-color photo. The tea ceremony was developed at the court of the shogun in late Ashikaga times

under such men as Soami, and his father and grandfather, Geiami (1431-1485) and Noami, who were painters, landscape gardeners, and poets in Kyoto. The greatest of the tea masters, under whom the tea ceremony (*chanoyu*) took final shape, was Sen no Rikyu (1521-1591). Zen preached the importance of the simple, uncluttered life. As a Zen priest and tea instructor, “Rikyu believed that amid the solitude of calm withdrawal from worldly cares sought by those who practice *chanoyu*, there should exist an element of creativity that leads to the serene enjoyment of beauty. The heart of this creativity, according to Rikyu's Zen aesthetics, lies in the careful avoidance of the trite, the obvious, and the emphatic. Beauty has its most powerful effects when it arises from suggestion and restraint...”

“Centuries ago, it was a rule that Zen priests ate only two regular meals a day—morning and noon. But since the priests engaged in rather strenuous work, by evening they were often hungry, and to assuage this hunger they would eat a light meal, which was called *yakuseki* (‘hot stones’). This term came from the practice of putting heated stones inside their clothing, by which the priests staved off hunger and cold during long sessions of meditation. When the tea masters developed the custom of serving a meal during the tea ceremony, they called it *kaiseki* (‘breast stones’). By evoking the image used in the Zen term, they seasoned their specialty with religious connotations.”

Soy-related recipes include: Miso soup (with aonorifu, azuki beans, and mustard, p. 29, plate 1, at Opening, the first of the 12 kaiseki months). Miso soup (with sesame custard, ginkgo nuts, and mustard), and Mukôzuke (with yuba and bonito flakes, p. 41, plate 9, at Evening). Miso soup (with wakanafu, kampyo [kanpyo], and mustard), and Azukebachi (hot dish, with sea cucumbers boiled in saké and mirin, boiled yuba, citron peel garnish, p. 53, plate 17 & 22, at New Year's). Miso soup (with Sanshu miso, roasted momen bean curd [grilled tofu], and black [soy] beans), and Hassun (with natto wrapped in sea bream filets, and miso-pickled chisha stems, p. 65-66, plate 25 & 31, at Spring). Miso soup (with icicle radish, temarifufu, and mustard), and Azukebachi (hot dish, with octopus boiled in saké, and yuba, garnished with Japanese pepper, p. 77, plate 33 & 36, at Doll Festival). Miso soup (with yuba, warabi fern shoots, and mustard, p. 89, plate 41, at Flower Viewing). Miso soup (with walnut custard, trefoil, and mustard, p. 101, plate 49, at Brazier). Miso soup (with eggplants, bamboo shoots, and mustard) and Wanmori (abalone and bean curd custard, chisa leaves [a variety of lettuce], and grated ginger, p. 113, plate 57 & 59, at Off Season). Miso soup (with Sanshu miso, shiratamako, junsai) and Wanmori (with yuba and egg custard, asauri, and wasabi, p. 125, plate 65 & 68, at Morning). Miso soup (with Sendai and Sanshu-miso, koimo, and hojiso), and Yakimono (with deep-fried eggplant slices coated with white miso and broiled), and Hassun (broiled burdock wrapped in yuba, and deep-fried green peppers, p. 137-38, plate 73 &

76, at All Soul's Day). Miso soup (with namafu, shirouri, and mustard), and Azukebachi (hot dish, with deep-fried dumplings of bean curd and hamo {sea/conger eel}, and broiled eggplants), and Hassun (with abalone cooked in sake and miso, soy beans in the pod [green vegetable soybeans] p. 149-50, plate 81, 85 & 86, at Moon Viewing). Miso soup (with koimo, zuiki, and sesame seeds), and Mukôzuke (with abalone, bean curd, and sesame seeds), and Wanmori (with boiled pine mushrooms and bean curd, nori, citron peel, p. 161, plate 89 & 92, at Closing).

Interesting Glossary entries: (1) *Daitokuji-nattô*, a “variety to which extra salt has been added, from the Daitokuji temple in Kyoto where it was first made as a preserve to be eaten in times of famine.” (2) “*Fu* is the general name for a light cake made of wheat gluten. The two basic types of this cake are uncooked (*namafu*) and baked (*yakifu*). The names that precede the suffix refer to what has been added to the gluten, the shape of the cake, or the area famous for a certain kind of cake. *Aonorifu* is baked and contains *Aonokiro*. *Chôjifu* is made long (=cho-) and cut to fit the bowl. *Daitokuji-fu* is fried cake that originated from the Daitokuji temple in Kyoto. *Temarifu* is a cake in the shape of a child's ball (=temari). *Wakanafu* contains several kinds of young greens (=wakana) that give it a fresh springlike color.”

Note: This is the earliest English-language document seen (Nov. 2011) that uses the term *Daitokuji-nattô* (with a diacritical mark above the o -> ô, and hyphenated) to refer to this Japanese type of “fermented black soybeans.” Address: Kyoto, Japan.

577. Watanabe, Tokuji; Ebine, Hideo; Ohta, Teruo. eds. 1971. *Daizu shokuhin* [Soyfoods]. Tokyo: Korin Shoin. 271 p. Illust. Index. 22 cm. [134 ref. Jap; eng+]

• **Summary:** This is the best book published to date on soyfoods in Japan; however it is written in Japanese. Contents: 1. Classifications and varieties of soybeans (p. 1). 2. Physical characteristics of soybeans (p. 5). 3. Chemical characteristics of soybeans (p. 9). 4. Standards and methods of examining soybeans (p. 47). 5. Special characteristics and problems of using soybeans for food (p. 53).

6. Current status of the soybean industry in Japan (p. 63). 7. Soymilk and various types of tofu: Aburage (deep-fried tofu pouches), ganmodoki (deep-fried tofu burgers), kôri-dofu (dried frozen tofu), soymilk, and yuba (p. 75). 8. Fermented soyfoods: Natto (p. 123-40), shoyu (p. 141-67), miso (p. 168-95), fermented tofu (*rufu*) (p. 196-202). 9. Other soyfoods: Kinako (p. 203-04), soy sprouts or moyashi (p. 206-08), tempeh or tenpe (p. 209-17). 10. Quality and usage of defatted soybeans (*dasshi daizu*) (p. 219).

11. New food uses of soybeans and especially defatted soybeans (incl. 70% soy protein powder, soy protein curds, soy protein isolate, surimi gel, spun soy protein fibers) (p. 229). 12. Advice regarding supplying protein from

organizations such as the United Nations and FAO (p. 257).

A 47-page translation of portions of this book (parts of Chapter 6 and all of Chapter 7) by Akiko Aoyagi and Chapters 8.1 and 8.2 by Alfred Birnbaum are available at Soyfoods Center.

Tokuji Watanabe was born in 1917. Hideo Ebine was born in 1921. Teruo Ota was born in 1926. Address: National Food Research Inst., Tokyo.

578. Watanabe, Tokuji; Ebine, Hideo; Ohta, Teruo. eds. 1971. *Nattô* [Natto]. In: Tokuji Watanabe, H. Ebine and T. Ohta, eds. 1971. *Daizu Shokuhin* [Soyfoods]. Tokyo: Korin Shoin. 271 p. See p. 123-38. [5 ref. Jap; eng+]

• **Summary:** An excellent scholarly work. This chapter was translated by Alfred Birnbaum. Chapter 8, titled “Fermented soyfoods,” has four parts, beginning with “Natto.”

Introduction: There are two types of natto: regular natto (*itohiki natto*), produced by the action of natto bacteria on cooked soybeans, and salty natto (*shio-natto*), produced by letting a koji mold [*Aspergillus oryzae*] grow on the cooked beans [to make soybean koji], then adding salt water. Although both are traditional fermented soyfoods that have been passed down in Japan from ancient times, the fermenting agent, production method, and nature of each product are different. The main fermenting agent for regular natto is bacteria and, as no salt is added to the basic ingredients as with salty natto, the ripening time is shorter, although the finished product does not keep well. Also regular natto has the characteristic of forming large amounts of sticky filaments. We will discuss salty natto separately.

At present, the production of regular natto is by far the larger of the two, being carried out in all regions of Japan; this product is better known and is usually referred to as simply “natto.”

8.1.1 Regular natto (*itohiki nattô*): (a) The history of natto: The origins of natto are not certain, but tradition has it that it was discovered some 1,000 years ago in the Tôhoku [northeast] region of Japan and has been passed down to the present. At first it was made by wrapping cooked soybeans in rice straw, but since 1920, when Dr. Hanzawa of Hokkaido's Agriculture Department first succeeded in producing pure-culture bacteria, industrialized production has been carried out as it is today using this pure culture. Whereas formerly, when natural fermentation dependent on the natto bacteria found in the rice straw meant instability of production levels and many questions of sanitation, this new method has become the basis for today's comparatively safe industrialized natto production.

(b) Regionality of natto consumption: Before World War II, consumption of natto was confined almost exclusively to the Tôhoku region (northeast prefectures) and further north, though recently it has spread throughout Japan. This tendency is most noted in the cities, which are now areas of large consumption. For example, looking at the cities listed

by prefecture in the Tables of National Consumption, we find that in 1968 the average amount per capita spent that year on natto was highest in Sendai at 967 yen, followed by others such as Sapporo 719 yen, Fukushima 915 yen, Mito 871 yen, Tokyo 489 yen, Nagoya 177 yen, Kyoto 183 yen, Osaka 98 yen, Hiroshima 139 yen, Matsue 144 yen, Matsuyama 78 yen, and Fukuoka [the furthest south, in northern Kyushu] 217 yen, the national average being 343 yen. While there exist many large differences between the various in money spent, we can see clearly that the consumption of natto has spread nationwide.

8.1.2 Natto bacteria and their characteristics: Although natto has a history of some 1,000 years, the history of bacteriological research on the bacteria that produce natto amounts to less than 100 years. The oldest bacteriological study on natto-producing bacteria in Japan is thought to be Yabe's report in the 15th issue of the *Journal of the Japanese Chemists' Society* (1895) that he had succeeded in isolating several strains of bacteria from natto.

From that time on, much research was carried out on natto bacteria, but it was not until 1906 that Sawamura successfully isolated from those natto bacteria a bacterium which, when recultured on cooked soybeans, would consistently produce the characteristic sticky filaments and flavor of natto. Upon researching the morphological and propagative characteristics as well as the physiological makeup of this bacterium, he found it to be very similar to *Bacillus mesentericus* and named the new strain *Bacillus natto* Sawamura. This research ascertained that natto is produced solely by the fermenting action of the natto bacteria. The bacteriological characteristics of this strain are shown in Table 8.1.

However in the 6th edition (1948) of *Bergey's Manual of Determinative Bacteriology* recognized the world over as the authoritative classification of bacteria, *B. natto* Sawamura is listed under *B. subtilis*, whereas the 7th edition fails to list it at all. In other words, as far as Bergey's classification is concerned a sub-strain of *B. subtilis* is responsible for natto fermentation. Be that as it may, culturing any of the bacteria which closely resemble *B. natto*, such as *B. subtilis*, *B. cereus*, *B. megaterium*, or *B. mycoides*, on cooked beans fails to produce a product of natto's sticky filaments and flavor.

The choice of strains to be actually used in producing natto is carried out by testing which successfully produce a natto with characteristic filaments and fragrance. Moreover, common to all natto bacteria chosen in this way are found to be certain marked differences from other *B. subtilis* strains. For example, while natto bacteria can neither germinate nor grow without biotin, other strains of *B. subtilis* can. Further, while a bacteriophage that dissolves natto bacteria has been discovered, this bacteriophage has no effect on other strains. Judging from evidence such as this even if natto bacteria were to be classified under *B. subtilis*, for all practical purposes they are clearly a bacterial group having special

characteristics distinct from other *B. subtilis* strains.

8.1.3 Natto bacteria growth and soybean composition: Natto bacteria grow well on cooked soybeans of course, but they also grow well on other beans, and other foodstuffs of plant origin such as grains. They can even grow on animal foodstuffs such as meat, fish, and dairy products. However, growth on plant protein is greater, as is the production of sticky filaments. As exhaustive research has been carried out on the composition of nutrients needed for the germination and growth of natto bacteria, and those nutritional requirements are now clear. The result was that natto bacteria use sugars, particularly dextrose, sucrose, glucose, etc. as sources of carbon, and that sucrose was necessary not only for bacterial growth, but also for the production of the sticky filaments. Soybeans are approximately 20% of carbohydrate in composition, some 30% of that being sucrose, enough for the growth of natto bacteria.

Protein, that is to say amino acids, are used as nitrogen sources. Of these amino acids, natto bacteria find glutamic acid, arginine, aspartic acid, proline, etc. easy to utilize whereas threonine, tryptophane, phenylalanine, methionine, etc. are comparatively difficult. However of the amino acids composing the soybean's protein work better as a nitrogen source does a culture medium of milk casein.

In regard to vitamins, natto bacteria require biotin, any culture media lacking in biotin being incapable of causing spore germination or growth of the nutrient cell (*eiyo saibo*). Though certain bacteria classified as belonging to the same genus, such as *B. subtilis*, *B. megaterium*, and *B. cereus*, do not require biotin, besides *B. natto* such other members of the *Bacillus* family such as *B. mycoides*, *B. pumilus*, and *B. coagulans* do not require biotin, while the absolute minimum density of biotin necessary for natto bacteria growth is 0.18%, complete growth requires at least 18%. Other vitamins particularly the B group, are useful in creating a suitable growing medium for natto bacteria, and as shown in Table 8.2, soybeans contain biotin sufficient not only for the germination of natto bacteria spores, but also for the propagation of the nutrient cell, thus eliminating any need for adding biotin in the production of natto.

8.1.4 Natto bacteria growth and environment: Beyond a doubt the single most important thing in the production of natto is to allow the natto bacteria to grow fully on the cooked soybeans, however in order to achieve this, it is also important to know what environmental conditions are most conducive to the germination and propagation of natto bacteria. In the production of natto, the natto bacteria used are in the forms of spores, either in a liquid cells (*eiyo saibo*) and finally proceed into cell division.

The optimum temperature for natto bacteria spore germination is approximately 40°C, most spores having germinated and begun propagation within 2 hours on a peptone-glucose culture medium, though at 50°C the germination is rather slow, and at 55°C and above no

germination can be found within a 24 hour period.

Tables show: 8.1 Propagative and physiological characteristics of *Bacillus natto* Sawamura. 8.2 Vitamins in soybeans (per 100 gm). Continued. Address: National Food Research Inst., Tokyo.

579. Watanabe, Tokuji; Ebine, Hideo; Ohta, Teruo. eds. 1971. Hamanattô [Hamanatto]. In: Tokuji Watanabe, H. Ebine and T. Ohta, eds. 1971. Daizu Shokuhin [Soyfoods]. Tokyo: Korin Shoin. 271 p. See p. 123, 139-40. [Jap; eng+] • **Summary:** An excellent scholarly work. This subchapter was translated by Alfred Birnbaum. Chapter 8, titled "Fermented soyfoods," has four parts, beginning with "Natto."

Introduction: There are two types of natto: regular natto (*itohiki natto*), produced by the action of natto bacteria on cooked soybeans, and salty natto (*shio-natto*), produced by letting a koji mold [*Aspergillus oryzae*] grow on the cooked beans [to make soybean koji], then adding salt water. Although both are traditional fermented soyfoods that have been passed down in Japan from ancient times, the fermenting agent, production method, and nature of each product are different. The main fermenting agent for regular natto is bacteria and, as no salt is added to the basic ingredients as with salty natto, the ripening time is shorter, although the finished product does not keep well. Also regular natto has the characteristic of forming large amounts of sticky filaments. By comparison, salty natto requires that the koji-molded soybeans ripen in saltwater, the main fermenting agents being the koji mold in the beginning, and yeasts and lactic acid bacteria towards the latter end of the process. As the amount of salt present is high, the ripening time required is comparatively long, taking ordinarily from several months to about a year. Salty natto is usually sold as a blackish, semi-dried product, with absolutely no formation of sticky filaments, but rather with a distinctive flavor derived from the addition of the salt and other seasonings. The large amount of salt used also makes it keep well.

At present, the production of regular natto is by far the larger of the two, being carried out in all regions of Japan; this product is better known and is usually referred to as simply "natto." On the other hand, salty natto is produced as the specialty product of such specific places as Kyoto (*Daitokuji nattô*), Nara (*Jofukuji-nattô*), and Hamamatsu (*Hama-natto*) (p. 123).

8.1.9 Hama-nattô: Hama-natto is a variety of salty natto made in and around Hamamatsu in Shizuoka prefecture. It is unrelated to regular (*itohiki*) natto except that both are fermented soy products. Rather, it is closer to miso. It is said that the first true production of Hama-natto dates from the time when Tokugawa Ieyasu became the lord of Hamamatsu Castle [1568] and wrote instructions to the monks of the nearby Daifukuji temple.

(a) Production method: The basic ingredients are 100 kg

soybeans, 9.2 kg wheat or barley flour, 18 kg salt, 7.5 kg of ginger, and koji starter. Large-seeded soybeans, such as those from the Orani region of Hokkaido or Tsuru-no-ko are used. The wheat or barley is roasted then ground to a no. 85 mesh or finer flour. The ginger is thoroughly washed, thinly sliced, and pickled in shoyu [Japanese soy sauce].

Fig. 8.4 is a flow chart of Hama-natto production. First inspect the large soybeans for any extraneous matter or imperfect beans, then wash them thoroughly to rid them of any sand or dirt. Soak in water at 20°C for 3-4 hours, then allow to drain for several hours. Steam for 5-6 hours at normal pressure, then leave overnight in the steaming vat. The next morning, spread out the beans and allow to cool to below 40°C. Then mix in koji starter (*tané-koji*). Sprinkle the roasted flour on top of this and mix the entire mass well.

Spread the mixture evenly in wooden koji trays and place in a koji incubation room at 30-33°C for approximately 50 hours to allow the growth of the koji mold. When the mold has grown sufficiently, remove the koji rays from the incubation room and allow to sun-dry outdoors until the moisture content of 30-35% at the time of removal from the room, falls to 20-25%, at which point place the mixture in wooden kegs or small vats. Add enough saltwater (or shoyu, which is occasionally used) to just cover the molded soybeans. Place a pressing lid and weight on top of the mixture, and allow to stand for 6-12 months as it ripens.

After the full fermentation is complete, spread the mixture out on a cloth to dry in the sun and mix in the pickled ginger, to make the final product.

Hama-natto is a simple food [or seasoning], dull blackish in color, but the flavor is deep and rich, and its nutritional value and storability are both excellent. Its percentage nutritional composition is shown in Table 8.10. Address: National Food Research Inst., Tokyo.

580. Watanabe, Tokuji; Ebine, Hideo; Ohta, Teruo. eds. 1971. Nattô [Natto]. In: Tokuji Watanabe, H. Ebine and T. Ohta, eds. 1971. Daizu Shokuhin [Soyfoods]. Tokyo: Korin Shoin. 271 p. See p. 123-38. [Jap; eng+]

• **Summary:** Continued. The same is also true of 10°C and below. Thus, the ideal temperature for the initial fermentation period of natto is approximately 40°C, though in actual production practices the natto bacteria inoculation takes place at 80°C and above. This is not only due to the fact that natto bacteria spores are highly resistant to heat and lose almost no germination strength at this temperature, but also because germination proceeds rather more effectively if the dormant spores are exposed for a short period of time to high temperature.

For example, if the spores are given a heat treatment of 100°C for 10 minutes or 85°C for 30 minutes, the germination rate goes up. Of course, once the heat treatment is completed it is necessary to reduce the temperature to the optimum germination temperature immediately. Loss of

capacity for germination due to heat only at 100°C for 30 minutes and above. Further, there is almost no lowering of the germination rate from low temperature, even at -20°C for 1 year. Once germinated, however, the nutrient cell does not have the heat resistance of the spore = its optimum propagative temperature being 40-50°C, it would die in 5 minutes at 100°C. Further, while growth can be found at 50°C and below on culture media with good nutritional conditions for natto bacteria, such as cooked soybeans, no growth can be found on media lacking those conditions. At 55°C and above, growth almost stops, and at 20°C and below, the growth rate drops to 1/10 or less of that at 40°C.

Natto bacteria growth is also effected by hydrogen ion density. While natto bacteria propagate well in neutral to slightly alkaline pH, both germination and growth decrease with increased acidity, and severe harm occurs at pH 4.5 and below. Most cooked soybeans fall within the range of pH 6.4-6.8, and as ripening progresses they gradually become more alkaline, reaching pH 7.2-7.6 at the completion of their ripening process. Also, oxygen is needed for natto bacteria growth, yet though in actuality the density of carbon dioxide in the natto fermentation chamber sometimes goes over 15%, it has almost no effects on natto's ripening process.

8.1.5. Natto production: In the past, natto was made by wrapping cooked soybeans in rice straw and leaving them in a warm place, allowing the natto bacteria on the straw to transfer to the cooked beans and having them ferment until filaments formed, whereas today's natto uses pure cultured natto spores for inoculation and convenient sanitary containers, the temperature and moisture levels of the fermentation chamber being controlled by automatic regulatory equipment, typical of the many modernizations now applied. Natto production proceeds as shown in figure 8.1.

(a) Ingredient soybeans: up to 10 years ago, domestic medium-sized and small beans were used as ingredient soybeans for natto. Besides specifically small bean varieties, beans sorted out as small through a mesh called "*Banseki-shita*" were used; as shown in Tables 8.3 and 8.4, the compositional differences between different bean sizes of the same variety were small, whereas the differences in size distribution according to growing region were particularly notable. Both the Koganeshiro and Kitamishiro varieties shown in the tables produced a greater number of small bean soybeans when grown in the Kitami Region than in the Tokachi Region. Further, if one compares the relatively small weight per thousand beans Tokachi-nagaha and Koganeshiro varieties from the very same Tokachi Region, or even the Kitamishiro variety, there is no sharp difference in composition, nor even much difference in the complete sugars (zento) (that portion of reduced sugars produced through hydrochloric acid hydrolysis) which greatly affect the qualitative value of soybeans used for natto.

Thus while the reason may not always seem clear why

small beans are so highly regarded as ingredients for natto, upon thorough inquiry we find that small beans have a higher water absorbency, the cooked beans are easier to make natto from, that production proceeds more smoothly, and finally, the small beans are easier to eat.

Compositional differences between soybeans are clearly reflected in quality, much as in the last 10 years we have seen a move from using domestic Japanese soybeans to using those imported from China, to where now 80% of all soybeans used for natto production are Chinese soybeans. Although one might cite the nationwide rise in production technology levels as the reason, the main reason for this shift is that domestic soybean planting has decreased, making them a difficult to obtain ingredient priced far above imported soybeans.

Domestic soybeans contain more carbohydrates, especially the fermentable sugar, sucrose, than imported soybeans, the cooked beans having a better, more naturally sweet flavor. For this reason, natto bacteria propagate better, with excellent formation of sticky filaments, and the natto is generally easier to produce. Among imported soybeans, Chinese beans are preferred, American beans being said to be difficult to make natto with, though it not the case that American beans have been found unconditionally not suitable for natto, but rather that they have not been used because American soybeans have not yet been thoroughly studied. Among Chinese soybeans, Manchurian small bean varieties are preferred, such other varieties as Jingshanpu, Hulan, and Dengshou also enjoying some reputation. Certain small beans selected from those American soybeans imported for miso production are also used for natto.

(b) Selection and washing: The ingredient soybeans are first put into a sorting machine which removes extraneous materials, imperfect or damaged beans, and dirt and sand, and also performs the needed bean size sorting, though nowadays the soybean wholesaler has taken on the responsibility for this step. The selected soybeans are then washed at the natto factory to remove any sand and dirt on the beans' surface. This step utilizes the bean washing machine pictured in Figure 8.2 (photo).

(c) Soaking: After washing is completed, the soybeans are soaked in water to allow full absorption of moisture. The amount absorbed by soybeans is 1.2 to 1.5 fold, that is to say they become 2.2 to 2.5 times the weight of the soybean before soaking. In order to achieve this full absorption, a soaking of 24-30 hours at a water temperature of 0-5°C, 16-20 hours at 10-15°C, or 8-12 hours at 20-25° is necessary. A 200-400 L stainless steel or plastic-lined tub is used for the soaking container. Ordinary water may be used for soaking if it meets the standards for drinking water, though if the calcium hardness is 500 p.p.m. and above, softening the water with conditioning agents allows the beans to cook softer, and if the iron content is 5 p.p.m. and above, it is necessary to remove the iron to prevent a blackening of the

cooked beans.

(d) Cooking: Almost all cooking is presently done in steam-trapping pressurized vats, 60 kg (4 *tô*) capacity, 70 kg (5 *tô*) capacity and 120 kg (6 *tô*) capacity vats being equipment in standard use. See Fig. 8.3 (photo of pressure cooker). Gradually, more and more stainless steel vats are coming into use. The newest vats are cylindrical with hand or electric-powered mechanisms for rotating the drum, thus not only eliminating any unevenness of cooking and facilitating removal of the cooked beans, but also occasionally allowing for the natto bacteria inoculation to occur in the vat with the following step of mixing accomplished by rotating the drum. In cooking, the pressure inside the vat is allowed to reach 1 to 1.5 kg/cm squared, and maintained at that level for 20-30 minutes, after which time the pressure cook is opened slightly to allow the pressure to fall.

(e) Natto bacteria inoculation and packing: The natto bacteria used is that sold directly from the specialist manufacturer of inoculant bacteria, available in either liquid or powdered form, though both contain approximately  $1-10 \times 10^7$  natto bacteria spores per gram. Usually 5 gm of inoculant bacteria diluted in 3-5 liters of sterilized water is used per 60 kg of soybeans. The normal method of inoculation is to sprinkle the dilute bacterial solution or to pour it with a ladle over the cooked beans while they are still 80°C or above.

Figures show: 8.1 Flowchart of natto production. Tables show: 8.3 Soybean characteristics by size and by growing region. The regions are: Koganeshiro: Tokachi, Kitami, Kitamishiro: Takachi, Kitami. Tokachi-nagaha: Tokachi. For each sub-region are given figures for large, medium, and small soybeans—15 in all. For each of the 15 soybean types, the following figures are given: Distribution by bean size (percentage; totals 100% for each region). Seed to coat ratio. Weight per 1,000 beans (gm) (ranges from 272 to 131). Water absorbency (%) after 8 hours, 15 hours, and 24 hours. Percentage of eluted solids (*yôshitsu kokei-bun*) after 24 hours. Note: Elution is a term used in analytical and organic chemistry to describe the process of extracting one material from another by washing with a solvent.

Table 8.4. Soybean composition by size and by growing region. The 3 regions and 5 sub-regions are the same as in table 8.2. For each of the 15 soybean types is given percentage of moisture, protein, fat, carbohydrate, ash, total sugars (*zento*). Continued. Address: National Food Research Inst., Tokyo.

581. Watanabe, Tokuji; Ebine, Hideo; Ohta, Teruo. eds. 1971. *Nattô* [Natto]. In: Tokuji Watanabe, H. Ebine and T. Ohta, eds. 1971. *Daizu Shokuhin* [Soyfoods]. Tokyo: Korin Shoin. 271 p. See p. 123-38. [Jap; eng+]

• **Summary:** Continued. As soon as inoculation is completed, a standard measure of the cooked beans is immediately packed into containers. This packing step is the step lagging most behind mechanization in natto's production process.

Although an automatic measuring and packaging machine to pack a standard measure of the cooked beans into containers without harm will no doubt be developed someday, at present this step is largely done by hand. One reason is that the containers used are specialized and of many types.

(f) Containers: The packaging containers for natto are made of straw, then wood sheets, man-made paper, polyethylene, high-density polyethylene (a kind of HDPE, *haizekkusu* = Hai-Zex, developed by Suzuki Chemical Co.), polystyrene, etc. alone or in combination. Although with straw and wood sheeting, there are problems of sanitation caused by the presence of many unwanted bacteria, the image of simplicity presented by such materials is well suited to a traditional food such as natto, and many consumers like such packaging. Thus, straw and wood sheeting are used, having been sterilized first.

(g) Fermentation chamber: Up until a few years ago, natto was made in insulated double-wall fermentation chambers, the temperature being controlled by charcoal fire or electric heat, and the moisture level being maintained by boiling water in the chamber, but since the development of automatic natto production equipment, natto can now be made without the constant care that was formerly required. The principle behind this change of improved insulation, thus accommodating and averaging of fermentation chamber interior temperature and moisture levels.

The natto bacteria on the cooked beans germinate around the optimum temperature of 40°C. At this time, heat is not yet produced by fermentation, so a pilot light is used to prevent the chamber temperature from falling below 40°C. Some 4-6 hours after placement in the chamber, a fermentative heat accompanying the natto bacteria preparation arises, and both the temperature of the product and of the chamber increase. The equipment is set so that cooling will come on during this time if the chamber temperature rises to 42-45°C and above. Within approximately 6-8 hours, the product temperature climbs to 50-53°C. After several hours at this temperature, the product temperature is cooled to external air temperature and fermentation is stopped approximately 14-18 hours after placement in the chamber. To prevent the moisture level in the fermentation chamber from reaching the dew point under the forced-air cooling, care is taken to prevent excessively moist air from being cycled into the chamber.

(h) Storage and transport: Once fermentation is completed, the natto is taken out of the fermentation chamber, cooled to 10°C and below in a cooling chamber and then shipped. In case it is not to be shipped it is kept at 2-7°C in a refrigeration room.

(i) Natto production results: The ingredient soybeans vary somewhat, but 100 parts soybeans will produce 220 parts cooked soybeans and 200 parts natto.

8.1.6 Compositional changes in the soybean during the natto production process: (a) Chemical change: As natto

bacteria fermentation progresses the components of the soybean break down and its structure softens, thus making it easier to digest and absorb. Concerning the changes occurring throughout this period (as shown in Table 8.5), we find that among the carbohydrates, the complete sugars those reduced sugars released by 205% hydrochloric acid hydrolysis, decrease from the beginning to the middle of fermentation. From the start of heat production during the fourth hour of natto's fermentation when protein reduction begins to the completion of ripening at 16-18 hours, we find that nearly 60% of the protein has been changed into water soluble nitrogenous compounds, though only a relatively minor approximate 10% have been reduced to amino acids. The progressive stages of protein reduction are shown in Table 8.6. After the sixteenth hour at which natto's ripening is generally thought to be complete, there is an increase in ammonia production, bringing an increase in a distinct ammonia smell.

(b) Changes in soybean structure caused fermentation: Although the main changes in protein are as described above, the changes in soybean structures brought about by the action of natto bacteria are as in the summarized observations reported by Iguchi, et al. While both uncooked and cooked soybeans stained to a uniform brick color throughout by Millon's reagent (*miron shikiyaku*), it was clearly found that natto is broken down progressively from the outer surface, and on staining fat with Sudan III, both uncooked and cooked soybeans showed a distribution of fat globules of uniform size throughout the cell, but in natto's outer cells, the breakdown of the protein causes these fat globules to fuse together into large clusters. Further, in the outer surface of the soybean, it was shown that when the intercellular material breaks down the state of decomposition has begun.

Note: Sudan III is a lysochrome (fat-soluble dye) diazo dye used for staining of triglycerides in frozen sections, and some protein bound lipids and lipoproteins on paraffin sections.

Saio et al. have observed under the electron microscope the structural changes undergone by the embryonic leaf of the soybean during the natto production process, and according to their findings, the components of the soybean do not exist uniformly throughout the soybean; for example, the bean becomes natto the protein bodies themselves are broken up and fat droplets spill out into the intercellular areas, though upon staining with osmium tetroxide (*shisanka osumiumu*) stain it was found that the fat had already lost the ability to maintain a droplet state and had permeated the cellular structure itself.

8.1.7 Special components of natto: (a) Natto flavor: The flavor of natto being produced by natto bacteria fermentation, it is said that the main flavor comes from substances broken down from soybean proteins. As stated under the heading of Compositional Changes During Fermentation, the breaking down of soybean proteins under the action of natto

bacteria turns 50-60% of those proteins into water soluble nitrogenous compounds, of which 10% are amino acids. Table 8.7 on the distribution and isolability (ability to be isolated) of the amino acids in natto shows that each amino acid is different and that glutamic acid, said to be directly related to flavor, has a isolability of 11%, with a rather strong 0.36 gm per 100 gm of natto. In addition, such other amino acids as threonine, tryptophan, leucine, valine, etc. have high isolability.

Organic acids are also related to flavor. As shown in Table 8.8, acetic and lactic acids are in abundance, although the same amounts are present in cooked beans. Those organic acids that increase in fermentation are butyric, propionic, and succinic (*kohaku-san*) acids, the production of butyric acid being greatest in rice straw-wrapped natto. Occasionally there will be a bitter taste or strong smell to natto, or a mold-like spotting on its surface, the bitter taste coming from a peptide having isoleucine at its nitrogen extremity, and the mold-like spotting often being a crystallization of tyrosine. Further, the main causal component of the unpleasant smell, commonly referred to as "lazy fragrance" (*fushoko*), is said to be isovaleric acid. That which known as the smell of natto is related to the presence of the above-mentioned ammonia, organic acids, fatty acids, etc., as well as to diacetyl (*jiasechiru*; IUPAC systematic name: butanedione or 2,3-butanedione). Diacetyl increases along with natto ripening, though it decreases with the storage of the final product. Note: Diacetyl is a natural by-product of fermentation.

Tables show: 8.5 Compositional changes in natto during fermentation (after 0, 4, 8, 12, 16, and 18 hours).

8.6 Morphological changes in nitrogenous compounds (percentage of dry material, percentage of total nitrogen) after 0, 4, 8, 12, 16, and 18 hours.

8.7 Amino acids in natto (per 100 gm) (total amino acid, gm), isolable amino acid (gm, isolability %).

8.8 Organic acids in natto (Kibara et al.) (After 0, 3, 6, 9, 12, 15, 16 hours of fermentation, and after 1 or 2 days of storage). For each time is given: Moisture (%), valeric acid (or pentanoic acid), butyric acid, propionic acid, acetic acid, levulinic acid (*reburin-san*), succinic acid (*kohaku-san*), lactic acid. Note: Formation of sticky filaments begins after 3-6 hours of natto fermentation. A strong smell is emitted after 2 days of storage. Address: National Food Research Inst., Tokyo.

582. Watanabe, Tokuji; Ebine, Hideo; Ohta, Teruo. eds. 1971. Nattô [Natto]. In: Tokuji Watanabe, H. Ebine and T. Ohta, eds. 1971. Daizu Shokuhin [Soyfoods]. Tokyo: Korin Shoin. 271 p. See p. 123-38. [Jap; eng+]

• **Summary:** Continued. 8.1.8 Natto-related products: (a) Dried natto: Natto is either soaked in strong saltwater, or sprinkled with table salt and left for 15-20 hours, at which time it is spread out thinly in a container and sun-dried.



If mechanical heat drying is to be used, a moisture-tight container through which dry air with less than 20% moisture and approximately 40°C is circulated until the moisture in the natto reaches 8% or less. If the drying temperature exceeds 60°C, flavor and coloration are affected unfavorably.

(b) Natto hishio: Rice koji and table salt are added to natto and weighted for 2-3 weeks until ripened. Kombu, ginger, dried daikon, and salt-pickled vegetables are sometimes also added. The usual ratio of natto to rice koji to salt is about 5:4:1.

(c) UNICEF Powder: The Japanese Ministry of Agriculture and Forestry's Food Research Center under request from UNICEF for 3 years starting from 1959 cooperated in research to develop a dried powder form of natto. It is a "predigested" high soy protein powder in which the soybean structure has been softened by a short fermentation by natto bacteria.

The product process is the same as for natto, except that its fermentation is cut short at 6-8 hours, it is then press-ground to noodle shape, the moisture level is reduced to 4% or less at a reduced atmosphere of 30mmHg or less, and finally ground finely in impact-type mills. The resultant product is a powder of light yellow color and comparatively low moisture sensitivity, it has no soybean smell but rather a light fragrance and delicate flavor, and has a relatively great storability. Table 8.9 compares the composition of UNICEF Powder and cooked soybeans. A biscuit containing UNICEF Powder was production- and taste-tested, with the result reportedly being that the failure rate was high for biscuits containing 30% or more of the powder, and that the taste was acceptable up to about 15%. A trial of these 15% UNICEF Powder biscuits was then run on school children to ascertain their taste acceptability over a 30 day period and it was found to be liked by all, regardless of grade level or sex.

Moreover, Kosuge (?), et al. succeeded in isolating a compound called tetramethylpyradine from natto, a compound with a strong ability for sublimation and whose smell at certain strengths greatly resembled that of natto; it is supposed that it is one component of the natto's fragrance. An illustration shows the chemical structure of tetramethylpyradine.

(b) Natto's sticky filaments: Natto's sticky filaments are living compounds made by the action of natto bacteria on the components of the soybean, mixtures of glutamic acid polypeptides and *furakuton* (?) of layered *furakutosu* (?). While the comparative amounts may fluctuate, the former is said to comprise 60-80% of the whole, strong filament formation being accounted for by the polypeptides and *furakutau* (?) contributing towards a normalized level of stickiness. In investigating these glutamic acid polypeptides, the surface of the natto was rinsed with approximately its volume of water, the resulting dilute fluid was then separated in a centrifuge, the lighter upper liquid of which was further passed into a cellophane membrane, and finally dropped into

methanol, forming sticky particles whose molecular weight was approximately 15,000; Thus, it is estimated that these are clusters of some 100 molecules of glutamic acid.

It has been shown experimentally that these sticky filaments are made by natto bacteria working on L-glutamic acid. The glutamic acid that composes these sticky filaments includes D-shape glutamic acid, which comprises anywhere from 20-80% of it. The sticky filaments make up about 2% of the natto on a dry-weight basis, and at their most stable level have a pH of 7.2 to 7.4, though the stickiness becomes weaker at a greater alkalinity or acidity. For example, on flavoring natto for the eating, the addition of table salt, rather than of shoyu, will produce more filaments. The greatest reason for natto whose filament formation is weak is contamination by unwanted bacteria or by a natto bacteriophage, etc.

(c) Natto enzymes: Within each 1 gm of natto there are approximately 10 million natto bacteria which produce large amounts of enzymes. Of each type of enzyme, the strongest are those enzymes for breaking down proteins, and in particular, alkaline proteinase as has been crystallized by Mitake, et al. This crystalline proteinase shows the highest level of activity at pH 8.2 and at 55°C, and though it is stable at pH 5-8, if the temperature rises to 55°C and above it becomes unstable, and it is destroyed when heated for 10 minutes at 65°C and above. Its digestive strength on casein is said to be stronger than that of commercial preparation *pankureachin* (?). Also, the action of such enzymes such as amylase, cellulase and lipase in natto are strong.

(d) Natto's nutritional and medicinal values: Natto enjoys the reputation of being high in nutritional value, perhaps the greatest reason given is that in a rice-centered diet like that of Japan, such soyfoods as natto are of great importance as protein sources. Though the main nutritional components are that of the soybean itself, as was previously stated in natto, the breakdown of the soybean structure and digestion of the protein are fairly accomplished, thus the digestibility is increased. According to the research of Hayashi et al., the digestion and absorption rate of white mice fed a diet of 68 parts white rice and 28 parts natto and 4 parts inorganic salt was 93.2% broken down compositionally to 86.8% protein, 89.8% fat, and 97.4% sugars, much higher than for cooked soybeans. In vitamins, a notable increase of vitamin B-2 to a level 5-10 times that before fermentation or approximately 1 mg per 100 gm of natto is found. Also, 30% of the vitamin B-1 inactivated during pressure cooking is reactivated during fermentation. Further, there is much discussion about the effects of the digestive enzymes stored in natto, however, we have not been able to locate any research as to whether these enzymes produce benevolent effects within the body. Although there is much tentative evidence and basic research to the effect that natto is helpful in the prevention and cure of such contagious diseases as dysentery and intestinal typhus, at present it is still uncertain

among medical specialists whether natto can prevent food poisoning or intestinal ailments, or whether it is of value as a convalescent dietary food.

Table 8.9 shows: Comparative composition of cooked soybean powder and UNICEF's fermented soybean powder. Footnotes are given concerning: soluble nitrogen, total sugars, and total acids. Address: National Food Research Inst., Tokyo.

583. Nakano, Masahiro. 1972. Synopsis on the Japanese traditional fermented foodstuffs. In: W.R. Stanton, ed. 1972. *Waste Recovery by Microorganisms: Selected Papers for the UNESCO/ICRO Work Study*. Kuala Lumpur: Ministry of Education, Malaysia. See p. 27-48. Distributed in the USA by UNIPUB, New York.

• **Summary:** Contents: Introduction. Miso. Shoyu. Tane-koji. Koji. Natto. Sake. Concluding remarks. Appendix. Address: Tokyo, Japan.

584. Kameda, Yukio; Matsui, K.; Kato, H.; Yamada, T.; Sagai, H. 1972. Antitumor activity of *Bacillus natto*. III. Isolation and characterization of a cytolytic substance on Ehrlich ascites carcinoma cells in the culture medium of *Bacillus natto* KMD 1126. *Chemical and Pharmaceutical Bulletin* 20(7):1551-57. July. [8 ref]

• **Summary:** At least two kinds of cytolytic substances that acted on Ehrlich carcinoma cells in the culture medium of *Bacillus natto* KMD 1126. One of these cytolytic substances was found "to be identical with surfactin which was a potent clotting inhibitor in the thrombin fibrinogen system obtained from the culture medium of *Bacillus subtilis* by Kakinuma et al.

Note: Natto, which is defined as "fermented beans," might be better defined as "fermented soybeans." Address: Faculty of Pharmaceutical Sciences, Kanazawa Univ., 13-1 Takara-machi, Kanazawa, Japan.

585. Ebine, Hideo. 1972. Fermented soybean foods in Japan. *Tropical Agriculture Research Series* No. 6. p. 217-23. Sept. Symposium on Food Legumes.

• **Summary:** Production of fermented soybean foods in Japan in metric tons (tonnes) (1968): Miso: 553,000 tonnes; includes the use of 169,000 tonnes of whole soybeans, 6,600 tonnes of defatted soybeans, 84,400 tonnes of rice, 18,200 tonnes of barley, and 71,200 tonnes of salt. In addition, roughly 200,000 tonnes of miso are made at home in Japan.

Shoyu: 1,027,000 kiloliters; includes the use of 14,900 tonnes of whole soybeans and 147,320 tonnes of defatted soybeans, 126,600 tonnes of wheat, 7,700 tonnes of wheat bran, and 172,200 tonnes of salt.

Natto: 90,000 tonnes; includes the use of 47,000 tonnes of whole soybeans.

Note that miso uses more soybeans than shoyu. Annual per capita consumptions of these foods was: Miso 6.7

kg, shoyu 10.2 liters, and natto 760 gm. Address: Head, Fermentation Div., National Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo.

586. Menezes, Tobias J.B. de. 1972. Alimentos e molhos obtidos por fermentacao da soja e de cereais [Foods and sauces obtained by fermentation of soybeans and cereal grains]. *Boletim do Instituto de Tecnologia de Alimentos (Campinas, Sao Paulo, Brazil)* No. 31. p. 49-63. Sept. [24 ref. Por]

• **Summary:** Contents: Introduction. Shoyu (*molho de soja*). Miso. Natto. Tempeh. Sufu. For each food, there is an introduction and a description of the process for making that food, sometimes with a flowchart.

Note: This is the earliest Portuguese-language document seen (Oct. 2011) that mentions fermented tofu, which it calls "sufu." Address: Brazil.

587. Saio, Kyoko; Watanabe, Tokuji. 1972. Advanced food technology of soybean and other legumes in Japan. *Tropical Agriculture Research Series* No. 6. p. 209-16. Sept. Symposium on Food Legumes.

• **Summary:** The following amounts of whole soybeans (in 1,000 metric tons) are used in Japan to make these products: Tofu and fried tofu 295, miso 169, natto 47, Kori-tofu (dried or frozen tofu) 34, shoyu 15, kinako 12, others 70. Total 642.

The following amounts of defatted soybeans (in 1,000 metric tons) are used in Japan to make these products: Shoyu 154, tofu and fried tofu 77, miso 8, others 45. Total 284. Grand total: 926. Address: 1. Senior Research Officer; 2. Director. Both: National Food Research Inst., Shiohama 1-4-12, Koto-ku, Tokyo.

588. *Los Angeles Times*. 1972. Are menus a puzzle? Master a few of those foreign food phrases. Oct. 6. p. F16.

• **Summary:** Foods listed under "Japan" include: "... Miso: Bean paste. Natto: Steamed and fermented bean... Shoyu: Soy sauce... Tofu: Bean curd."

589. Ishikawa, Hisao; Okubo, Katsumi; Oki, Tae. 1972. Nattô nenshitsu-butsumi yôeki no eishisei (hiki ito sei?) ni tsuite [Characteristic spinability of a natto mucin solution]. *Nippon Kagaku Kaishi (J. of the Chemical Society of Japan)* No. 11. p. 2171-77. Nov. (Chem. Abst. 78:73434.) [22 ref. Jap]

• **Summary:** A purified mucin solution, which was isolated from natto (fermented soybeans), was composed of fructan and poly-DL-glutamic acid in the ratio of 22.1% and 77.6%. Address: Faculty of Agriculture, Ehime Univ., Matsuyama-shi, Japan.

590. Kiuchi, Kan; Ohta, Teruo; Fujiie, Hiroko; Ebine, Hideo. 1972. [Studies on enzymatic hydrolysis of soybean polysaccharides. I. Purification and properties of

hemicellulase from *Bacillus subtilis* No. 17]. *Nippon Shokhin Kogyo Gakkaishi (J. of Food Science and Technology)* 19(12):585-90. [Jap]\*

Address: National Food Research Inst., Tokyo.

591. Leung, W.-T.W.; Butrum, R.R.; Chang, F.H. 1972. Food composition table for use in East Asia. Atlanta, Georgia: Center for Disease Control, U.S. Dept. of Health, Education, and Welfare. xiii + 334 p. Dec. No index. 30 cm.

• **Summary:** Part I. Proximate composition, mineral and vitamin contents of East Asian foods, by Woot-Tsuen Wu Leung, Ph.D. (Nutrition Program, Center for Disease Control, Dep. of Health, Education and Welfare), and Ritva Rauanheimo Butrum, M.S., and Flora Huang Chang, B.S. (Federation of American Societies for Experimental Biology).

Part II. Amino acid, fatty acid, certain B-vitamin and trace mineral content of some Asian foods, by M. Narayana Rao, Ph.D., and W. Polacchi (Food Policy and Nutrition Division, Food and Agriculture Organization of the United Nations).

In Part I, Food Group 3 titled “Grain legumes and legume products” (p. 16-22) gives the composition of the following (100 grams edible portion and as purchased): Adzuki beans (*Phaseolus angularis*; incl. “Azuki-an,” and boiled sweetened). Asparagus bean: See Cowpea, yardlong. Asparagus pea: See Goabean. Bambara groundnut or jugo bean (*Voandzeia subterranea*). Bengal gram: See Chickpea. Blackeyed pea: See Cowpea, catjang. Blackgram: See Mung bean. Broad bean or horse bean (*Vicia faba*; incl. “Fuki-mame” and “Otafuku mame”). Burma bean: See Lima bean. Butter bean: See Lima bean. Catjang pea: See Pigeonpea. Chickpea or Bengal gram (*Cicer arietinum*). Cowpea, all varieties (*Vigna* species). Cowpea, yardlong: See Cowpea, all varieties. Dhal: See Lentil. Dolichos, Australia pea (*Dolichos lignosus*). French bean: See Kidney bean. Goabean [goa bean], asparagus pea, or winged bean (*Psophocarpus tetragonolobus*). Golden gram: See Mung bean. Green gram: See Mung bean. Haricot bean: See Kidney bean. Hindu cowpea: See Cowpeas, all varieties. Horse grain or horse gram or Madras gram (*Dolichos uniflorus*; *D. biflorus*). Horsebean: See Broadbean. Note 1. This is the earliest English-language document seen (Jan. 2005) that uses the word “horsebean” or the word “broadbean” to refer to *Vicia faba*.

Horsegram: See Horse grain. Hyacinth bean or Indian butterbean (*Lablab niger*; *Dolichos lablab*). Indian bean: See Mung bean. Indian butterbean: See Hyacinth bean. Jackbean, common (*Canavalia ensiformis*). Jugo bean: See Bambara groundnut. Kidney bean, French bean, navy bean, pinto bean, snap bean, or string bean (*Phaseolus vulgaris*; incl. “Usura-mame”). Lentil or dhal (*Lens culinaris*; *Lens esculenta*; *Ervum lens*). Lima bean, butter bean, or Burma bean (*Phaseolus lunatus*; *Phaseolus limensis*).

Note 2. This is the earliest English-language document seen (May 2003) that uses the scientific name *Lens culinaris* to refer to lentils.

Note 3. This is the earliest English-language document seen (Jan. 2009) that uses the name “Burma bean” to refer to the lima bean.

Madras gram: See Horse grain. Mung bean, Indian bean, red bean, green gram, golden gram, or blackgram / black gram (*Phaseolus aureus*; *Vigna radiata*; incl. vermicelli, dried starch, starch jelly, instant powdered green or red products with sugar and flour added). Mung bean, black gram or urd (*Phaseolus mungo*; *Vigna mungo*). Navy bean: See Kidney bean. Peanut or groundnut (*Arachis hypogaea*; incl. raw, roasted, with or without shell, salted, parched, seasoned, fried, peanut flour, peanut butter, peanut milk, peanut cake—defatted, peanut cake—defatted and fermented [onchom]). Peas, garden or field (*Pisum* species; incl. parched—salted, “Uguisu-mame”). Pigeonpea, or catjang pea (*Cajanus cajan*; *Cajanus indicus*). Pinto bean: See Kidney. Red bean: See Mung bean. Rice bean (*Phaseolus calcaratus*; *Vigna calcarata*). Soybean and soy products (Glycine max; *G. hispida*; *G. soja*; p. 19-21), incl: Whole mature seeds—dried (yellow, black), whole immature seeds dried, whole seeds—salted (black, green, green soaked, fried, fermented {natto}, pickled, roasted), flour of roasted soybeans, defatted soybeans—whole seeds. Soybean products: Curd—unpressed, curd—tofu—raw (plain, kinugoshi, fukuroiri), curd—tofu—fried (moist type, dried type—regular size, dried type—small size, canned, abura age), curd—roasted [grilled], curd—tofu—fermented (home-prepared, jarred), curd—tofu (dried—spongy square, preserved, dried—rope-like, commercial {fermented with chili pepper}—jarred), curd cheese, curd sheet (milk clot sheet {yuba}) (moist type, dried type, pickled in soysauce), curd—pressed—raw (plain, fermented, spiced, strips—semi-dry), miso (Japan) (plain, sweet {5.3% salt added}, salty—light {10.4% salt added}, salty—dark {11.7% salt added}, mame-miso {9.7% salt added}, powdered {18.5% salt added}), paste [jiang] (plain, fermented, red pepper added, sweet, malt), soybean milk (unenriched—unsweetened, “Kaset” {Thailand; canned—concentrated, fluid}, Saridele {a mixture of soybeans, sesame seeds or peanuts, with vitamins and calcium added—Indonesia}), soybean sauce (dark—thick, light—thin, unspecified), tempeh (fermented soybean product, Indonesia), “Budo-mame” (cooked—Japan), Soybean residue [okara] (liquid, powder). Urd: See Mungo bean. Velvetbean (*Mucuna utilis*; *Stizolobium utilis*; incl. dried or mold-treated {tempeh}). Winged bean: See Goabean, Indes.

Food Group 4 titled “Nuts and seeds (p. 23-29) includes: Almonds, hemp seeds—whole, perilla—common (*Perilla frutescens*), safflower seeds, sesame seeds, sunflower seeds (*Helianthus annuus*), watermelon seeds.

Food Group 5, titled “Vegetables and vegetable products” (p. 30-75) includes: Amaranth, mungbean sprouts, seaweeds (many types), soybeans—immature seeds [green

vegetable soybeans], soybean sprouts (raw, cooked).

Note 4. This is the earliest English-language document seen (March 2004) that mentions silken tofu, which it calls (in a table): “Curd, tofu, raw: ‘Kinugoshi,’ Japanese preparation.”

Note 5. This is the earliest English-language document seen (Dec. 2005) that contains the term “flour of roasted soybeans.”

Note 6. This is the earliest English-language document seen (Oct. 2006) that uses the term “Blackeyed pea” to refer to the cow pea. Address: Dep. Health Education and Welfare.

592. Hayashi, Yoshio; Kawabata, Noboru; Taguchi, Kuniko. 1972. Nattô no nenshitsu-butsu ni kansuru kenkyû [A study of the viscous substances in natto. B.]. *Kyoto Furitsu Daigaku Gakujutsu Hokoku B (Scientific Reports of the Kyoto Prefectural University, B)* No. 22. p. 13-. [Jap]\*

593. Sundhagul, Malee; Smanmathuroj, P.; Bhadocharoen, W. 1972. Thua-nao, a fermented soybean food of northern Thailand. I. Traditional processing method. *Thai J. of Agricultural Science* 5(1):43-56. \*

• **Summary:** This food, fermented with *Bacillus subtilis*, is a close relative of Japanese natto. Address: Thailand.

594. Aihara, Herman. 1972. Miso & tamari. *Macroguide (San Francisco: George Ohsawa Macrobiotic Foundation)*. No. 12. iii + 34 p. [3 ref]

• **Summary:** Contents: Preface. Part I: Miso. Introduction, the origin of miso, kinds of miso, ingredients (soybeans, barley, rice, salt, water) how to make miso [at home] (barley miso, rice miso, soybean miso, analytical comparison of the three kinds of miso, other types of miso, miso pickles) value of miso (protein, fat, minerals, poison prevention, heart disease, miso for beauty, stamina, miso for radiation and other diseases, miso soup), miso in the treatment of tuberculosis and atomic radiation exposure.

Part II: Tamari or traditional soy sauce. Introduction, history, chemical change of tamari, how to make tamari soy sauce at home, how to use soy sauce.

Part III: The other soybean foods. Tofu (preparation of soybean milk at home, coagulation of soybean protein, the formation of tofu in a mold [for homemade tofu], tofu for external treatment—tofu plaster, age—deep fried tofu [how to make at home]), natto (introduction, how to make natto at home).

Part IV: Appendix. Available publications, G.O.M.F. message.

Illustrations by Carl Campbell show: (1) Two traditional kegs of miso and a glass jar of tamari (title page). (2) Making mugi (barley) miso in Japan (9 steps; p. 10).

Note 1. This is the earliest English-language document seen (March 2009) that describes how to make miso at home. Recipes for three types of miso are given: Barley miso, rice

miso, and soybean miso. The method is translated from *Miso University*, by K. Misumi (in Japanese). Fortunately, the exact amount of each of 5 ingredients is given, and nine excellent illustrations show the main steps in the traditional process. Unfortunately, the instructions are somewhat vague.

Note 2. This is the earliest English-language document seen (Jan. 2012) that describes how to make natto at home. Address: San Francisco, California.

595. Food and Agriculture Organization of the United Nations (FAO). 1972. A selected bibliography of East-Asian foods and nutrition arranged according to subject matter and area. [Washington, DC]: Food and Agriculture Organization of the United Nations; U.S. Dept. of Health, Education, and Welfare. vii + 296 p. Dec. 27 cm. [1500\* ref]

• **Summary:** This book has two title pages and can be cited in two ways. See Leung (1972). Address: Dep. of Health Education and Welfare.

596. Hesseltine, C.W.; Wang, H.L. 1972. Fermented soybean food products. In: A.K. Smith and S.J. Circle, eds. 1972. Soybeans: Chemistry and Technology. Westport, CT: AVI Publishing Co. xiii + 470 p. See p. 389-419. Chap. 11. [54 ref]

• **Summary:** Contents: Introduction. Koji. Miso: Preparation of koji, treatment of soybeans (mixing, fermentation). Shoyu: Incl. chemical shoyu. Natto. Hamanatto. Tempeh. Sufu [fermented tofu]. New soybean products made by fermentation: Cheese-type products, fermented soybean milk, an ontjom-type product. 10. Future of fermented soybean foods.

Tables: (1) Demand for whole soybeans in Japan (1964-1967) to make miso, shoyu, and natto. In 1967, only 4.5% of the soybeans used to make miso were used in the form of defatted soybeans, whereas the same year 91.1% of the soybeans used to make shoyu were defatted. The total demand in 1967 (in 1,000 metric tons) was miso 177, shoyu 169, and natto 47. (2) Chemical composition of soybean foods: Miso (salty light, salty light, soybean miso), natto, soybeans. (3) Annual production of miso in Japan (1956-1967). Production of 530,078 tons in 1956 decreased to a low of 453,956 tons in 1962, then rose to 520,510 tons in 1967. (4) Composition of miso in relation to time of fermentation and ratio of soybeans:rice:salt for three types of miso: White miso, light-yellow salty miso, and yellow-red salty miso. (5) Average composition of shoyu made from whole soybeans and defatted soybean meal.

Illustrations (flowsheets, without quantities of ingredients) show: (1) Process for making red miso. (2) Process for manufacture of shoyu. (3) Process for making hamanatto. (4) Tempeh fermentation on a laboratory scale. (5) Preparation of sufu. (6) Preparation of soybean cheese. Address: NRRL, Peoria, Illinois.

597. Hosking, Richard. 1972. A dictionary of Japanese food: Ingredients & culture. Boston: Tuttle Publishing. 239 p. Illust. by Richard C. Parker. Index. 19 cm. \*

• **Summary:** An excellent, accurate book. The basic entry for each word is given under its Japanese name (thus *daizu* rather than soybeans). Each entry includes the Japanese term in kana (usually hiragana) and (usually) kanji (Chinese characters). One hundred small illustrations are very helpful. Address: Prof. of Sociology and English, Hiroshima Shudo Univ., Japan.

598. Jensen, J. Stoumann. 1972. Baelplanten. Frugtens anvendelse og potentiel i menneskelig ernæring. En analyserende og diskuterende oversigt [Leguminous plants. Use of their seeds and its potential for human nutrition. An overview, with analysis and discussion]. Unpublished manuscript. Lyngby, Denmark. 110 p. Forwarded to DANIDA Sept. 1974. Unpublished manuscript. [23 ref. Dan]

• **Summary:** Under East Asian soyfoods, mentions soy sauce, miso, natto, sufu, and tempeh. Address: Dep. of Biochemistry & Nutrition, Technical Univ. of Denmark, Lyngby, Denmark.

599. Kusano, Aiko. 1972. Nattô seizô katei ni okeru daizu tanpaku no henka. III. Nattô seizo-ji ni okeru TCA kayô-sei kubun no ion kôkan kuromatogurafii oyobi geru roka ni yoru bunkaku [Changes in soybean protein during natto production. III. Fractionation of TCA soluble fraction during manufacture of natto by ion exchange chromatography and gel filtration]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 25(1):21-24. [9 ref. Jap] Address: Faculty of Pedagogy, Gifu Univ., Nagara Gifu City, Japan.

600. Kwon, Tai-wan. comp. 1972. Fermented foods in Korea: Annotated bibliography (1917-1971). Seoul, South Korea: Korea Institute of Science and Technology. 185 p. 28 cm. For Fermented Soybean Products, see p. 28-85. [248\* ref. Eng]

• **Summary:** One of the best sources on soyfoods in Korea. A very well prepared bibliography. Of the 248 references, 83 are related to soy. Most of the documents cited were published in the 1950s and 1960s; only one (p. 28) was published before 1940.

Contents: 1. Fermented vegetable products (*kimchies* [*kimchi*]). 2. Fermented fishery products. 3. Fermented soybean products (soybean koji {meju, maiju, maeju}, soy sauce {kanjang, ganjang}, soy paste {doenjang, daijang, dwen-jang}, hot soy paste {kochojang, kochuzang}, etc.). 4. Fermented cereal products (alcoholic beverages). 5. Miscellaneous. Appendix. Author index.

Note 1. Doenjang (Korean soybean paste) is first mentioned on pages 28, 64. Daijang (Korean soybean paste) is mentioned on page 34. Dwen-Jang (Korean soybean paste)

is mentioned on page 42.

Kochojang (Korean red pepper miso) is first mentioned on pages 28, 31, 46. Kochozang (Korean red pepper miso) is first mentioned on page 36. "Red pepper sauce" (Korean red pepper miso) is first mentioned on pages 38, 39. "Red pepper paste" (Korean red pepper miso) is first mentioned on pages 71.

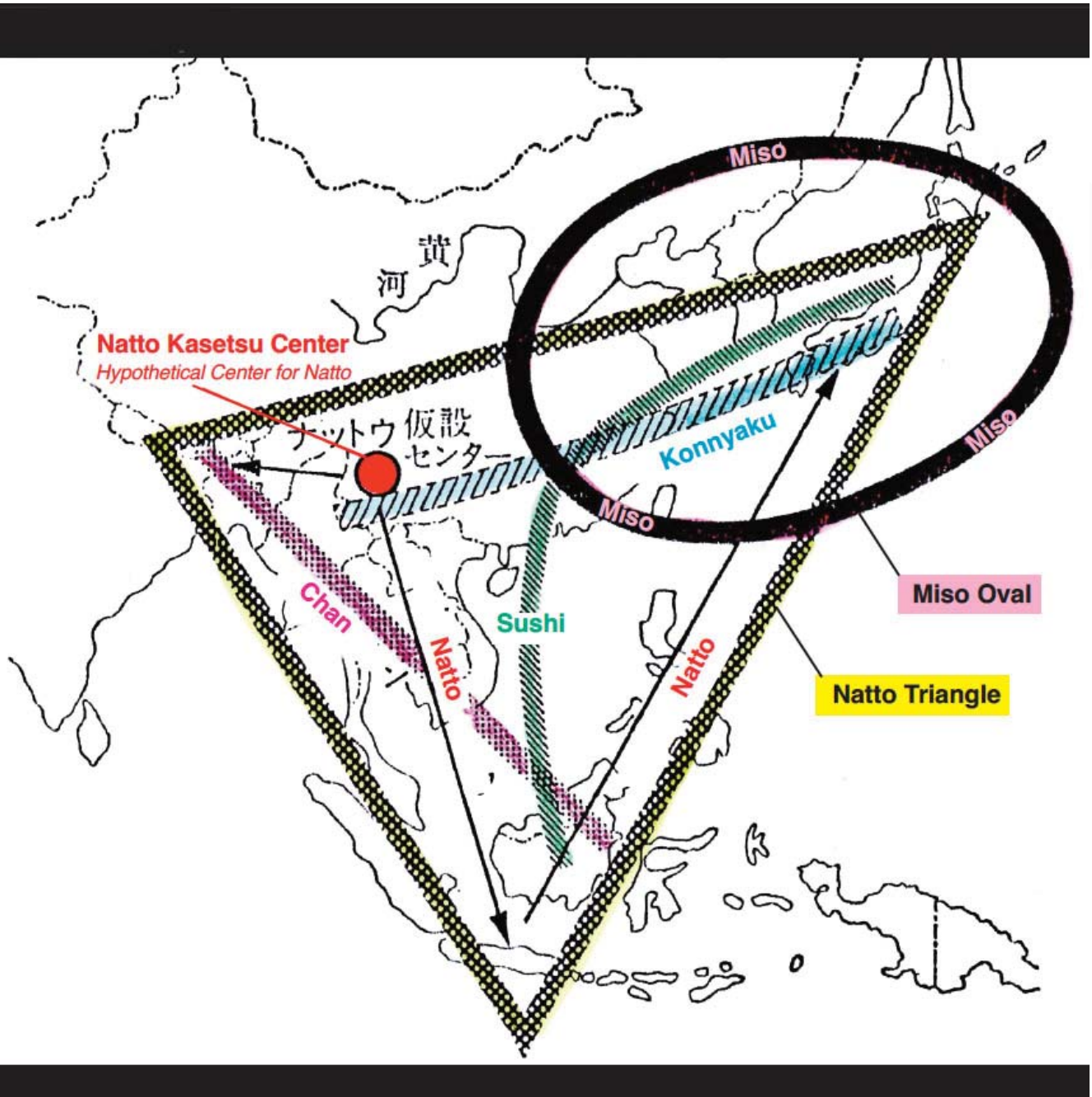
Kanjang (Korean soy sauce) is first mentioned on page 34. Note 2. This is the earliest English-language document seen (Jan. 2009) that uses the term "kanjang" to refer to Korean soy sauce. Ganjang (Korean soy sauce) is first mentioned on page 53.

Meju (Korean soybean koji) is first mentioned on pages 35, 41, 44, 60. Maiju (Korean soybean koji) is first mentioned on page 34. Maeju (Korean soybean koji) is first mentioned on pages 73, 83. Chung-Kook-Jang (Korean natto) is first mentioned on page 79.

Note 3. This is the earliest English-language document seen (Oct. 2010) that uses the word Chung-Kook-Jang (spelled exactly that way) to refer to Korean-style natto. Address: PhD, Head, Food Resources Lab., Korea Inst. of Science and Technology, Seoul, South Korea.

601. Liener, I.E. 1972. Nutritional value of food protein products. In: A.K. Smith and S.J. Circle, eds. 1972. Soybeans: Chemistry and Technology. Westport, CT: AVI Publishing Co. xiii + 470 p. See p. 203-77. Chap. 7. [417 ref]

• **Summary:** Contents: 1. Introduction. 2. Protein and amino acid requirements of man: Protein requirements, amino acid requirements. 3. Evaluation of protein quality: Amino acid composition, biological techniques involving animals, protein efficiency ratio (PER), N-balance studies, plasma amino acids, experiments with human subjects, amino acid availability, in vitro techniques (physical tests, available lysine, tests for biologically active components [urease, trypsin inhibitor], enzymatic and microbiological techniques). 4. Nutritional significance of other soybean constituents: Available energy, vitamins (fat-soluble vitamins, water-soluble vitamins), minerals (calcium, phosphorus, zinc, other minerals), unknown growth factor(s). 5. Factors affecting the nutritive properties of soybean protein: heat treatment, supplementation with amino acids, storage, germination, effect of antibiotics, dietary source of carbohydrate. 6. Soybean products used for human consumption: Soybeans as a vegetable, soybean flour (incl. Multi-Purpose Food (MPF)), soybean milk, soybean curd, other fractions, protein concentrates, protein isolates (use in infant foods, use in textured foods), fermented products (tempeh, natto, miso). 7. Use of soybean products as protein supplement: As supplement to wheat protein (bread, other baked goods), as supplement to corn, as supplement to rice, use in vegetable protein mixtures, peanut and other oilseed proteins, blends containing corn, other cereals and legumes. Address: Univ. of Minnesota.



602. Nakao, Sasuke. 1972. *Ryôri no kigen* [The origin of foods]. Tokyo: Nihon Hoso Shuppan Kyokai. 225 p. [Jap] • **Summary:** The important chapter titled “The big natto triangle and miso,” by Sasuke Nakano (p. 118-27) discusses natto, its relatives and ancestors in East Asia, and the “natto triangle” theory (with a map; see previous page). Nakao hypothesized that natto (*itohiki natto*, made with one or more strains of bacteria) originated in the monsoon area of Southeast Asia, where there are East Asian evergreen forests. He considered Yunnan province in China to be the hypothetical center of natto’s origin.

He states: We don’t know much about natto in Japan. Konnyaku was clearly mentioned in the literature of the Heian period [794-1185]. But natto was first mentioned later, during the Muromachi period [1336-1573], therefore I guess it came from Java [sic] at about that time. Many new things from Europe (such as guns) also entered Japan during the Muromachi period.

What I call the “Miso Group” is salted mold-fermented soyfoods—such as miso, shoyu, tamari, and fermented black soybeans (*douchi*)—that originated in northern China outside the Big Natto Triangle, then spread to central China and to other countries such as Japan and Korea. I have shown the Miso Group on the map in an oval to the upper right. So the triangle and the oval shows the locations of these two groups of processed, fermented soyfoods.

In the Big Natto Triangle we find a number of foods that originated in northern China, including konnyaku and sushi. Sake is also fermented with a mold—the koji mold. Bean sprouts (a great Chinese invention, using beans that are hard to cook) also exist in the Miso Oval, but they spread into many areas within the Big Natto Triangle including Burma and Java.

Nyufu [dairy cheese or yogurt; literally “decayed / spoiled milk”] and tofu: Tofu was also a great invention of northern China—an easy way to eat soybeans. Seen from this point of view, European ways of cooking beans are very primitive.

Note: European beans generally contain too little protein and too much carbohydrates (especially starch) to enable them to be made into tofu.

Mr. Shinoda Osamu has developed the theory that tofu was invented in China but not in ancient times; probably in the middle of the Tang dynasty [618-906], and it became popular in the middle Song dynasty [960-1279], at which time it became an alternative to *nyufu* made from dairy milk. What I call *nyufu* here is different from *funyu* (fermented tofu), which is made by fermenting tofu, appeared after the invention of tofu, and is found today throughout East Asia. It is difficult to know exactly what *nyufu* was; in my opinion it was probably like *dahi* from India. In any case, it is certain that there was a product in called *nyufu* shortly before the Tang dynasty and during the early Tang.

During most of Chinese history, except when the nomadic milk-consuming Mongols ruled China during the Yuan dynasty (1279-1368), animal milks were not part of traditional Chinese culture.

Tofu was in Japan by 1183 AD (see *Diary of Hiroshige NAKAOMI*, entry for 1183). Maybe tofu was brought in by Buddhist monks and consumed in and around Nara. By the end of the Muromachi period [1336-1573] the center of tofu making and use had moved to Kyoto.

Another interesting thing is that in southern China and in Sichuan province, there is a tofu named *reiki* [*li qi*, pronounced “lichei,” “morning prayer.”] The name originally referred to *nyufu* but later it came to refer to tofu. The origin of the word *reiki* was considered to be Sanskrit or some European language. It may have been connected with *nyufu* and/or dahi or India. Also, if we consider *reiki* to be the original name of tofu, then *nyufu* and tofu may have originated in Sichuan or southern China and migrated up to Northern China.

In summary: Nakano’s theory is based on the observation that there are many varieties of non-salted fermented soyfoods and soy condiments inside the “natto triangle.” Yunnan province in southwest China, Thailand, Myanmar (Burma), Bhutan, Nepal, Indonesia, and Japan all fall within this triangle.

Note 1. This is the earliest English-language document seen (Jan. 2012) that contains the term “natto triangle.” Yet this term can be misleading, especially for non-Japanese. Natto is the only non-salted fermented soyfood or soy condiment indigenous to Japan. Natto is made by fermenting whole, cooked soybeans with bacteria (*Bacillus natto*, or *Bacillus subtilis*) in a warm place (ideally 104°F or 40°C) for about 24 hours. According to various Japanese legends, natto originated almost 1,000 years ago in northeast Japan when cooked soybeans were placed in a rice-straw sack strapped over the back of a horse. The natto bacteria are found abundantly on rice straw, and the warmth of the horse’s body aided the fermentation. Under these conditions, the fermentation would take place naturally, without intentional inoculation.

The “natto triangle” refers to the geographical area within a large triangle in East-, South-, and Southeast Asia—the only place in the world where non-salted fermented soyfoods and soy condiments are indigenous. A number of these—such as tempeh in Indonesia and unsalted fermented black soybeans in China—are fermented primarily with molds (e.g., *Rhizopus*, *Aspergillus*) rather than bacteria. The triangle has its three corners in northeastern Japan (on the northeast, for natto), northeastern India and Nepal (on the west, for kinema), and in Java (Indonesia, on the south, for tempeh). It is incorrect to think of tempeh as a type of natto—by any definition! Applying this correction to the “natto triangle” causes it to fall apart! Extensive research after 1972 on the early history of tempeh and natto gave no support to the

conjecture that natto came from Java.

However the incorrect theory actually turned out to have powerful predictive value, especially as close relatives of natto were discovered in northeast India by Tamang and co-workers starting in 1988, more than 15 years after the “natto triangle” hypothesis was proposed.

603. National Food Research Institute. 1972. National Food Research Institute [Japan]. NFRI, Ministry of Agriculture and Forestry, Shiohama-cho 1-4-12, Koto-ku, Tokyo. 27 p. [144 ref. Eng]

• **Summary:** Contents: Brief history. Budget and personnel. Organization. General survey of the Institute. Major research area. Facilities and pilot plants. Reports and patents. Publications. Scholarship. Location.

In 1934, the Rice Utilization Research Laboratory was established by the national government. The first building of about 330 square meters was completed in 1935 at the present site. In 1944 the title of the Laboratory was changed to the Research Institute of the Bureau of Staple Food Administration, and investigations were directed toward the processing and utilization of unconventional food resources.

“Owing to the change in the food situation in Japan during World War II, the Institute carried out extensive research on the most efficient utilization of the nutrients in various foodstuffs, and on finding new food sources among various agricultural products, so as to meet the serious food shortage. This trend continued through the post-war period as the nation struggled with an even more acute food shortage problem. Fats and oils, fruits and vegetables, and fermented soybean products miso and soybean sauce were added as subjects of research.

“The Institute again changed its name to the Food Research Institute in 1947, and official analysis and standardization of food commodities were included in its activities... The Institute came to belong to the Food Agency in 1949 and later, in 1961, as a result of the reform in agricultural research administration, it was brought under the administration of the Agriculture, Forestry, and Fisheries Research Council together with other agricultural research establishments.” The name was changed for a third time to the National Food Research Institute in 1970.

T. Watanabe is the Director of the organization. The fermentation research division is headed by H. Ebine, and consists of the following laboratories: Fermentation microbiology (M. Matsuno), fermentation chemistry (T. Ohta), industrial fermentation (H. Ito), mycotoxin (H. Ebine), resources utilization (N. Tsumura). The nutrition research division is headed by S. Kimura.

Note: This institute moved from Tokyo to Tsukuba in Feb. 1979. Address: Shokuhin Sogo Kenkyujo, Tokyo, Japan.

604. Sakaguchi, Kinichiro. 1972. Development of industrial

microbiology in Japan. In: Proceedings of the [Sixth] International Symposium on Conversion and Manufacture of Foodstuffs by Microorganisms. Tokyo: Saikon Publishing Co. viii + 297 p. See p. 7-10. Held 5-9 Dec. 1971 at Kyoto, Japan. [Eng]

• **Summary:** Japan has made many important contributions to the development of industrial microbiology, especially industrial mycology, because of the widespread use of koji molds (*Aspergillus oryzae*). Foods made from this one mold (including sake, miso, and soy sauce) accounted for about 1.5% of the Japanese gross national product, or ¥75,000 billion, in 1970.

Early documents show that molds were being used to make foods as early as 1,000 B.C. in China and as far back as the 6th century [A.D.] in Japan. In Japan, the use of lactic acid fermentation in the pure culture of yeast is already mentioned in “the diary of sake” [*Goshu no Nikki*] written in 1355, however the technology of adding koji starter [*tané koji* or “seed koji”] is even 400 years earlier [i.e., ca 955]. Moreover, an unmistakable description of low temperature pasteurization (*hiire*) appears in the *Tamon-in Diary* (1539-1596), “which was written about 300 years prior to Pasteur’s famous invention.”

When Japan began to introduce European scientific techniques during the Meiji period (Sept. 1868 to July 1912), the first subject of scientific research in Japan was the unique koji mold. One of the first major discoveries was the invention of Takadiastase [an enzyme] by Jokichi Takamine. This enzyme has a great influence on biological chemistry, enzyme chemistry, and various enzymes using microorganisms worldwide.

Soon the physiology of the koji mold and its fermentation products (especially organic acids) was studied by Japanese scientists. The determination of kojic acid by Yabuta was a major discovery. The *Rhizopus* [*Rhizopus*] mold was also investigated; this led to the development of producing organic acids fumaric acid, citric acid, isocitric acid, itaconic acid, gluconic acid and others.

Two outstanding discoveries have recently been made in Japan: (1) The technology for making L-glutamic acid, lysine, and other amino acids; (2) The microbial technology for making flavor-enhancing nucleotides such as inosinic acid and guanylic acid.

Japanese scientists and industries soon realized that instead of using microorganisms, the enzymes isolated from them could be used (in whole or in part) with no reduction in yield or quality. In the case of *Aspergillus oryzae*, which produces various enzymes (amylase, lipase, protease, etc.) this idea has been applied to the manufacture of alcohol, sake, mirin, miso, and soy sauce.

The classification and taxonomy by Jun Hanzawa of microorganisms used in the manufacture of *natto* (fermented soybean) and other popular Japanese fermented foods was of major importance.



Recently, Japanese scientists including Murakami and Yokotsuka have found that the koji mold does not produce aflatoxins.

The industrial application of molds to establish a method of mass culture involves various difficult problems. Many Japanese manufacturers of sake, miso, and soy sauce “are practicing the conventional solid culture by using what are called Koji rooms” but large manufacturers are gradually switching over to aerobic apparatus.

To use the living action of microorganisms or their enzymatic action to make foods on a large scale will be increasingly seen “as a form of bioengineering or biotechnology,” and the life sciences will be increasing be spoken of as “a science for the future. ‘Seek whatever is desired in microorganisms first. They will never betray you,’ is my slogan.” Although it may seem a little exaggerated, “I should like to ask you to take it as my firm conviction.”

As I stated above, “microorganisms are the most intimate friends of the food industry,” yet they are at the same time its powerful enemies. Their malignant side is as powerful as their benevolent side.

I am very glad, even proud, to see first-class microbial specialists and food specialists exchanging technological knowledge and cooperating with one another, “here in Japan where fermented foods have so long been a tradition.” Address: Prof. Emeritus, Univ. of Tokyo, Tokyo, Japan.

605. Smith, A.K.; Circle, S.J. 1972. Historical background (on soybeans and soybean foods). In: A.K. Smith and S.J. Circle, eds. 1972. *Soybeans: Chemistry and Technology*. Westport, CT: AVI Publishing Co. xiii + 470 p. See p. 1-26. Chap. 1. [53 ref]

• **Summary:** Contents: 1. Introduction. 2. U.S. history: Introduction of soybeans, processing for oil, soybean oil. 3. Soybean meal and protein: Animal feed industry, poultry industry, industrial uses. 4. Soybean production. 5. Oriental history: Ancient history, Oriental fermented foods (shoyu, miso, tempeh, onjom, natto, hamanatto, tao tjo [Indonesian-style miso], kochu chang, ketjap), Oriental nonfermented foods (soybean milk, tofu), wedge press. 6. Soybeans and world food problems: Green Revolution, protein supplements (high protein food formulations, AID funded), amino acids, CSM, cottage industries.

Concerning industrial uses (p. 8-9): Soybeans rose in popularity as an agricultural crop in the USA at a time when other crops such as corn, wheat, cotton, and tobacco were being produced in surplus quantities. Soybeans took over much of the acreage vacated by these crops. “At that early period it was the hope of many leaders of agriculture, government, and industry that much of the oil and protein of the soybean could be diverted from the food and feed industries into industrial products such as paints, varnishes, soap stock, plastics, adhesives, plywood glue, paper coating and lamination, paper sizing, textile fibers, and other uses...

In 1936 the US organized the Regional Soybean Industrial Products Laboratory for this purpose. These new industrial uses were expected to help relieve the problem of farm surpluses... In 1935 the Glidden Company built the first plant for the isolation of industrial grade soybean protein (transferred to Central Soya in 1958). The largest use of industrial grade protein is in the paper-making industry, for coating and sizing of paper board.

“After World War I, soybean meal, because of its low cost, replaced casein as an adhesive for Douglas fir plywood glue, where it still retains a substantial part of the market for the interior grade product.”

“While soybean proteins have several important industrial applications, especially in the paper industry for coating and sizing paper, which are expected to continue for years to come, the original dream of an ever-expanding industrial market [for soy proteins] has faded. In the polymer market it appears that for most applications the proteins cannot be made competitive with the increasing number of low cost, high quality synthetic resins... It is generally recognized that the increasing demand for proteins for feed and food will greatly surpass the anticipated industrial uses.”

A graph (p. 1) shows: Soybean production in the United States for seed, 1940-1970. Address: 1. Oilseeds Protein Consultant, New Orleans, Louisiana; 2. Director, Protein Research, W.L. Clayton Research Center, Anderson Clayton Foods, Richardson, Texas.

606. Smith, Allan K.; Circle, Sidney J. eds. 1972. *Soybeans: Chemistry and technology*. Vol. 1. Proteins. Westport, Connecticut: AVI Publishing Co. xi + 470 p. Illust. Index. 24 cm. [500+ ref]

• **Summary:** One of the best and most comprehensive reviews on the subject, with extensive information on modern soy protein products. Each of the 12 chapters is written by an expert on the subject. Volume 2 was never published. Address: 1. PhD, Oilseeds protein consultant, New Orleans, Louisiana; 2. PhD, Director, Protein Research, W.L. Clayton Research Center, Anderson Clayton Foods, Richardson, Texas.

607. Smith, A.K.; Circle, S.J. 1972. Appendixes: Glossary of soybean terms: Terms used in conjunction with the processing of soybeans and the utilization of soy products. Official standards of The United States for soybeans. In: A.K. Smith and S.J. Circle, eds. 1972. *Soybeans: Chemistry and Technology*. Westport, CT: AVI Publishing Co. xiii + 470 p. See p. 438-56. Appendix. [4 ref]

• **Summary:** Glossary: Soybean(s), soybean processor, soybean processing (solvent extraction, mechanical processing, pre-press solvent processing), soybean oil, crude soybean oil, edible crude soybean oil, refined soybean oil, edible refined soybean oil, hydrogenated soybean oil, degummed soybean oil, winterized oil, technical grade

refined soybean oil, soybean fatty acids, soybean soapstock, acidulated soybean soapstock, soybean lecithin, break material, sludge.

Soybean products: Ground soybeans, ground soybean hay, soybean hulls, solvent extracted soybean feed, soybean meal, dehulled solvent extracted soybean meal, soybean mill feed, soybean mill run, heat processed soybeans, nitrogen free extract (N.F.E.).

Standard specifications: Soybean chips, soybean cake, 41% protein soybean meal, soybean flakes, 44% protein soybean meal, dehulled soybean flakes, 50% protein solvent extracted soybean meal.

Soybean proteins: Soy flour, soy grits, soybean meal, defatted soy flour, low-fat soy flour, high-fat soy flour, full-fat soy flour, lecithinated soy flour, protein, isolated protein, toasting, textured protein products (TPP), meat analogs.

Definitions: Soy grits and/or soy flour, isolated soy protein, soy protein concentrate.

Vegetable fats: Margarine, vegetable shortening.

Oriental foods: Soy sauce (shoyu), soy milk, miso, tofu, dried tofu, aburaage, kinako, namaage, ganmodoki, tempeh, natto, yuba, moyashi (soybean sprouts), vanaspati, ghee.

Official standards of the U.S. for soybeans. Soy flour standards. Analytical data range of commercial soy protein. Some U.S. companies marketing soy protein food ingredients. Nitrogen solubility index (NSI). Protein dispersibility index (PDI). Urease activity. Water absorption of soy flour. Address: 1. Oilseeds Protein Consultant, New Orleans, Louisiana; 2. Director, Protein Research, Anderson Clayton Foods, Richardson, Texas.

608. Yoshimoto, Akihiro; Nomura, S.; Hongo, M. 1973. Gamma-polyglutamic acid depolymerase induced by infections of *natto* and *subtilis* phages and its further properties. *Agricultural and Biological Chemistry* 37(1):83-90. Jan. [24 ref]

• **Summary:** Gamma-polyglutamic acid is known as PGA. Its depolymerase is an enzyme. Address: Lab. of Applied Microbiology, Dep. of Agricultural Chemistry, Kyushu Univ., Fukuoka, Japan.

609. Kameda, Yukio; Matsui, K.; Hosoya, K.; Nomura, A.; Sugano, N. 1973. Antitumor activity of *Bacillus natto*. IV. Purification and properties of an extracellular protease from *Bacillus natto* KMD 1126. *Chemical and Pharmaceutical Bulletin* 21(3):538-45. March. [21 ref]

• **Summary:** A protease is an enzyme that hydrolyzes proteins. This is an alkaline protease. "When a mixture of surfactin, the protease, and EDTA was incubated with carcinoma cells, a synergetic effect on the cytolysis of Ehrlich ascites carcinoma cells was observed." Address: Faculty of Pharmaceutical Sciences, Kanazawa Univ., 13-1 Takara-machi, Kanazawa, Japan.

610. Yoshikawa, Seiji; Nishimaru, Shinya; Tamura, Shinpachiro; Ishima, Toshio. 1973. Shokuhin no juyô yosoku no tame no imêeji chôsa: Sôshû-kei deeta [A sampling survey of consumer's image of 104 foodstuffs in Japan]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 28. p. 355-69. March. [3 ref. Jap]

• **Summary:** Soyfoods analyzed in the survey are: 21. Tofu. 22. Natto. 71. Miso. 72, Shoyu.

Reprinted from *Nihon Shokuhin Kogyo Gakkai Shi (J. of Food Science and Technology)* 19(4):165-79 (1972). Address: National Food Research Inst., MAFF, Tokyo, Japan.

611. Harper, Anne. comp. 1973. Soybean processing and utilization: A partially annotated bibliography. Jakarta, Indonesia: Lembaga Ilmu Pengetahuan Indonesia (Indonesian Inst. of Sciences), Jl. Tjhih Ditiro 43, Jakarta. vi + 56 leaves. 30 cm. [440 ref. Eng]

• **Summary:** Contents: Preface (by Prof. Sarwono Prawirohardjo, Chairman, ASEAN Permanent Committee on Science and Technology). Introduction: The soybean (*Glycine max*), soybean meal and oil, food uses, industrial uses, scope of the bibliography ("excludes references to non-alimentary utilisation of soybeans" and to "references to alimentary utilisation where the harvested plant has not undergone processing by either fermentation or oil extraction"), terminology of soybean processing (soybean meal, soy flours and grits, solvent extraction, miscella, desolventizer-toaster, defatted soy flour, low-fat soy flour, high-fat soy flour, full-fat soy flour, lecithinated soy flour, soy protein concentrates, soy milk, Saridele, yuba, soybean curd [tofu], aburage, koritofu [kori-dofu, dried frozen tofu], soy protein isolate, protein fibre products {spun, spinnerettes}, extrusion-expansion products, fermentation products {ontjom, *Neurospora sitophila*, soysauce, shoyu, *Aspergillus oryzae*, koji, moromi, tamari, koikuchi, natto, miso, tempeh, *Rhizopus oligosporus*, soybean cheese, sufu, *Mucor sufu*}, *Zygosaccharomyces*).

General (p. 1). Fermentation products (p. 2-16). Soybean oil, meal, and protein (p. 17-42). Nutrition (p. 43-56). Note: 500 copies were printed. Address: Indonesia.

612. Ilany (Feigenbaum), J. 1973. Soybean food for today and tomorrow. *Gordian (Hamburg)* 73(10):390-91. Oct.; 73(11):428-30. Nov.; 73(12):464-65. Dec. [21 ref. Eng; ger]

• **Summary:** "This is a short review of what is chiefly known at present of this wonderful bean, which only a few years ago, constituted a strange and exotic food." Contents: Introduction. Composition and nutritional value. Green soybeans. Sprouted soybeans. Soybean flours. Isolated proteins. Soy-food products of the Far East: Kinako, soymilk, yuba, "tofu or curd-soycheese," aburage, natto, Hamanatto, tempeh, miso, shoyu or soy sauce. Soybean oil.

Lecithin.

Concerning tofu: Tofu made in the regular way “is called ‘Fresh Tofu.’ It does not keep long, even under refrigeration, unless it is further processed. For this purpose it may be canned, frozen, fried, smoked, or fermented.”

Note: This is the earliest English-language document seen (Aug. 2011) that contains the term “soycheese”; it uses this term to refer to regular tofu.

613. Taira, Harue. 1973. Heat destruction of amino acids in soybean products. *JARQ (Japan Agricultural Research Quarterly)* 7(4):267-73. Oct. [11 ref]

• **Summary:** Traditional, processed soybean foods that are widely used in homes in Japan include “Shoyu (fermented soy sauce), Miso (fermented soybean paste), Natto (fermented soybeans), Tofu (bean curd), Aburaage (fried bean curd), Kori-tofu (dried Tofu) and Kinako (roasted soybean flour).”

One of the steps in making each of these foods is heating, which denatures the protein (making it more digestible), eliminates the peculiar soybean flavor, and develops colored substances (which “can prevent oxidation of the unsaturated fatty acid contained abundantly in soybeans during the fermentation process of miso as an example”). Heating also eliminates antinutritional factors.

“But overheating causes excessive denaturation of soybean protein and destruction of amino acids.”

Tables show: (1) Amino acid composition of 7 soybean products, including Mamemiso [soybean miso, such as Hatcho miso] and yuba. (2) Change of amino acid after three steps in the process of making Mame-miso: Soaking the soybeans, heating the soybeans, the final product. (3) Change of amino acid after two steps in the process of making natto: Heating the soybeans, final product. After heating at a rather high temperature for a short time (120°C for 30 minutes), there was no decrease in any amino acids except arginine, which decreased by 17.8%, and decreased by 29.1% in the final product. Some essential amino acids increased during the natto process. Methionine increased from 0.9 gm per 17 gm of nitrogen to 1.1 gm, an increase of 22.2%. Cystine remained unchanged at 1.0. (4) Change of amino acid after three steps in the process of making Tofu: Soaking the soybeans, heating the soybeans, the final product. No amino acids are reduced by heating, and some (such as methionine) increase. Of the 18 amino acids measured, 5 are unchanged, 10 increase, and 3 decrease slightly: Glutamic acid 19.6 > 19.3. Tryptophan 1.5 > 1.4. Serine 6.6 > 6.4.

One of the products which is heated by dry heat only (without soaking in water) is kinako. It is heated at 160°C for 10 minutes, then ground. This heating reduced lysine from 5.1 to 4.8.

Figures (graphs) show: (1) The heat destruction of lysine in defatted soybean flour at 4 different temperatures (from 100°C to 126°C) for 4 different times (from 30 minutes to 4

hours). The higher the temperature and the longer the time, the greater the destruction of lysine.

(2) The heat destruction of cystine in defatted soybean flour. Same 4 temperatures and times; roughly same results.

(3) The influence of water on the heat destruction of lysine in defatted soybean flour. Same 4 temperatures and times. Adding water reduces the destruction of lysine.

(4) The influence of water on the heat destruction of cystine in defatted soybean flour. Same 4 temperatures and times. Adding water reduces the destruction of cystine.

(5) Heat destruction of total and available lysine in defatted soybean flour. Same 4 temperatures and times.

(6) Enzyme treatment and total liberated amino acids. Address: Food Analysis and Nutrition Div., National Food Research Inst., Ministry of Agriculture & Forestry, Koto-ku, Tokyo.

614. **Product Name:** Natto.

**Manufacturer’s Name:** Aloha Tofu Factory Inc.

**Manufacturer’s Address:** 961 Akepo Lane, Honolulu, Oahu, Hawaii.

**Date of Introduction:** 1973.

**New Product–Documentation:** Hawaii Directory of Manufacturers. 1973. p. 10. Aloha Tofu Factory Inc., 1020 Auahi St., Honolulu, Hawaii 96814. The company makes tofu, aburage, natto, and konnyaku.

Oda. 1983. Hawaii Herald. Oct. 7. p. 5. “Tofu enjoys increasing popularity.” Ad in Hawaii Herald. 1983. Oct. 7. p. 20. “Make your favorite recipe even better with the best in soy bean products. Tofu, natto, aburage, konnyaku, okara, yakidofu.”

615. Azumaya, Naoki. 1973. Nattô-kin ni yoru bitamin B-2 seisan ni kansuru kenkyû. I. Nika oyobi sankatetsu ion no eikyô [Study on vitamin B-2 production by natto bacteria. I. The effect of divalent and trivalent ions]. *Kumamoto Joshi Daigaku Gakujutsu Kiyo (J. of Kumamoto Women’s University)* 25(1):45-52. [Jap]\*

616. Lee, Kap Sang; Chung, Dong Hyo. 1973. [Effect of *Bacillus natto* on Korean soybean paste]. *Hanguk Sikp’um Kwahakhoe Chi (Korean J. of Food Science and Technology)* 5(3):163-68. [Kor; eng]

• **Summary:** Discusses *Bacillus subtilis*.

617. Cowan, J.C. 1973. Processing and products [soybeans]. In: B.E. Caldwell, ed. 1973. Soybeans: Improvement, Production, and Uses. Madison, Wisconsin: American Society of Agronomy. xviii + 681 p. See p. 619-64. Chap. 20. [52 ref]

• **Summary:** Contents. 1. Introduction. 2. Processing for oil and meal: Preparation of flakes, solvents, extraction, desolventizer-toaster, degumming. 3. Conversion to edible oil products: Refining, bleaching, deodorization,

hydrogenation. 4. Edible fat products: Salad and cooking oils, status of flavor stability, shortenings and margarine oils, lecithin. 5. Essential fatty acids and atherosclerosis. 6. Industrial uses of oil. 7. Meal for livestock and poultry: Nutritional aspects, factors affecting use of meals. 8. Edible protein products: Soy flour, concentrates and isolates, textured protein products (textured soy flour or textured soy protein fibers made into “meat analogues” resembling chicken, bacon, etc.). 9. Fermented and specialty foods: Tofu, soybean milk (an intermediate step in the manufacture of tofu), miso, shoyu (tamari, light-colored shoyu), sufu, tempeh, hamanatto, and natto.

Soybeans flow through a crushing plant as follows: First, they are cracked to release or loosen the hull and to break the cotyledon into about 4 parts. Shakers and aspirators separate the hull from the cracked cotyledons and rollers flake them. “Purified petroleum hydrocarbons known as hexane extract the oil from the flakes and the solvent is recovered. Moistened flakes are heated to inactivate the antinutritional factors and are converted to feeds for livestock and poultry. A small proportion of the flakes goes to a wide variety of soybean protein products including flour, isolates, and concentrates.”

Tables show: (1) Utilization of soybean in U.S. in million pounds, every 5 years from Oct. 1933 to 1970 (Kromer 1970). (2) Use of soybean meal in the USA for feeding livestock and poultry (million tons). In 1969, the estimated amounts used were as follows: Cattle 3.43. Hogs 1.69. Other livestock 1.73. Total livestock: 6.85. Broilers 3.07. Hens and pullets 1.28. Other poultry 1.10. Total poultry 5.45. Total livestock + poultry 12.30. Note that cattle are the single biggest users. (3) Bleaching soybean oil (process, % clay and type, change in Lovibond color rating). (4) Effect of bleaching, citric acid, and light exposure on soybean salad oil. (5) Specifications for soybean oil. (6) Effect of linolenate content on flavor of soybean oil at elevated temperatures. (7) Composition of certain edible oil products from soybean oil and related products (salad oil, hydrogenated-winterized soybean salad oil, hydrogenated soybean oil liquid shortening, plastic shortening types I and II). (8) Changes in iron and copper content of soybean oil in commercial refining. (9) Properties of all-purpose and high-stability shortenings from all-hydrogenated vegetable oils and blends of animal fat and/or vegetable oil (iodine value, melting point, % linoleic acid, solid fat index {% solid at temperatures indicated}). (10) Typical analyses for mellorine and cookie and confectioner’s fat. (11) Analytical data for typical margarine oils low and high in polyunsaturates (iodine value, melting point, % linoleic acid, solid fat index {% solid at temperatures indicated}). (12) NSPA—tentative lecithin specifications (NSPA, 1969-1970). (13) Composition of soybean lecithins. (14). Approximate composition of soybeans and meal products (whole bean, cotyledon, hull, hypocotyl, meal {cake—extruded, flakes—solvent extracted,

dehulled flakes—extracted, mill feed—separated hulls, mill run—separated hulls}). (15) Amino acid analysis of soybean meal (44% protein and 49% protein {dehulled}) and corn. (16) Amino acid analysis of blends of soy flour with cereals and milk (Inglett 1968; Corn soy milk {CSM}, Millet soy milk, Wheat soy milk, etc.). (17) Partial formulas for young swine and boiler rations in percent total rations. (18) Partial formulas for dairy feeds (14% protein). A supplement to forage or roughage. (19) Soybean grits and flour—screensize. (20) Composition of soy flour. (21) Composition of 4 types of soy protein concentrates. (22) Uses for high-protein soy products (protein 70 [concentrates] and protein 90 [isolates]). Note: This is the earliest English-language document seen (Dec. 2004) that uses the term “protein 90” to refer to a soy protein isolate. (23) Amino acid analysis of fractions derived from dehulled extracted flakes (Rackis et. 1961, 1970). (24) Effect of cooking in salt solutions on texture of structured granules. (25) Composition and use (1,000 metric tons in 1964 and 1967) of soybeans for traditional foods in Japan (Use of whole soybeans in 1967 in 1,000 metric tons: Miso 169. Shoyu 15. Natto 47. Tofu 329. Total 642. Use of defatted flakes or grits in 1967 in 1,000 metric tons: Miso 8. Shoyu 154. Natto 0. Tofu 77. Total 284).

Figures show: (1) Flowchart: Processing of soybeans to oil and meal using hexane extraction. (2) Illustration: A modern soybean processing facility (aerial view, Central Soya, Inc.). (3) Schematic diagram / flowchart: Manufacture of edible soybean oil products (salad oil, salad and cooking oil, shortenings, margarines, liquid shortening). (4) Illustration: A continuous deodorizer for soybean oil. (5) Graph: Effect of prolonged storage at 100°F on flavor score of hydrogenated-winterized soybean oil or soybean salad oil (nitrogen packed, air packed). (6) Illustration: Continuous chilling and working equipment for margarine production (Votator Div., Chemetron Corp.). (7) Flow diagram; Conversion of emulsions of margarine oils and ripened milk to conventional stick, whipped stick, and tub margarines (Votator Div.) (8) Chemical structure of prostaglandin-E<sub>2</sub>, a fatty acid with hormone activity. (9) Diagram: Vapor-desolventizer- deodorizer for soybean flakes (Blaw-Knox Co.). (10) Flowchart and diagram: Operations with extruder-cooker. (11) Flow diagram: Manufacture of protein 70 [soy protein concentrate]. (12) Schematic diagram: Manufacture of soy protein isolate (Protein 90). (13) Photo: Chicken-simulated soy protein “meat” in three forms (Swift Edible Oil Co.). (14) Photo: Protein tow containing 16,000 monofilaments spread apart to show its fibrous nature; other tows in background (General Mills, Inc.). Address: NRRL, Peoria, Illinois.

618. Hunter, Beatrice Trum. 1973. Fermented foods and beverages. New Canaan, Connecticut: Keats Publishing Co. 116 p. Index. 18 cm. [38 ref]

• **Summary:** In the chapter titled “Soybeans” (p. 31-49), the

author discusses tofu (and how to make it at home with or without fermentation), meitauza (fermented okara), hakko tofu (a newly developed high protein food; fermented soybean curd), sufu (Vietnamese call it Chao), shoyu, miso, ketjap (thick Indonesian soy sauce [probably ketjap manis]), tempeh, Hamanatto, natto, Tao-cho from Malaysia, and Tao-si [fermented black soybeans] from the Philippines.

Note: The author has collected her information (both correct and incorrect) for a number of sources, which she does not cite directly, although she does have a bibliography.

619. Ito, Kazuo. 1973. *Issei: A history of Japanese immigrants in North America*. Translated by Shinichiro Nakamura and Jean S. Gerard. Seattle, Washington: Executive Committee for Publication of Issei, c/o Japanese Community Service, 1414 S. Weller St., Seattle, WA 98144. xxviii + 1016 p. Illust. Index of personal names only. 24 cm. Translation of *Hyakunen Sakura*. [100\* ref. Eng]

• **Summary:** This massive book is basically a history of first-generation Japanese immigrants to Pacific Northwest (especially Washington, Oregon, and British Columbia), focusing on the great struggles and hardships they met, written from the viewpoint of individual Japanese who tell their stories (often in the first person), and compiled by a Japanese journalist. The book was first published in Japanese. Access to the wealth of information it contains is crippled by the lack of a subject index. So if one were looking for information about tofu, miso, or soyfoods, one would have to read the entire book. The index of personal names is well done.

At the very front of this book are very interesting maps of the old Japanese districts of the following cities: Seattle, Tacoma, and Spokane, Washington; Portland, Oregon; Vancouver, British Columbia, Canada. Unfortunately, none of the maps are dated. The name and location of each Japanese organization or business is shown clearly in English. In the part on “Japanese exclusion,” the section titled “The smell of race” [very interesting] (p. 227-28) states: “Exclusionists especially point out that Japanese favorite foods and condiments, such as *miso*, soy sauce, radishes and pickles, are intolerable [in smell]... The neighboring whites complained loudly that they just could not stand the smell of cooking soy sauce... A Japanese smells like miso, and whites in general exude faint waves of the odor of butter and cheese. The smell of their underarm perspiration is really strong.”

In the part on “Railroads,” the section titled “Life of Yoshiichi Tanaka” notes that he worked with a gang of young Japanese bachelors who were all trying to save money. For breakfast they had miso soup, which was delicious, so everyone ate more, which caused food expenses to rise. “So we skimmed on miso and merely added salt for flavor.” For lunch they sometimes had “fish cooked in soy sauce, or a half cake of *tofu* (bean curd cheese), or radish, carrots and

beef boiled hard with soy,...” “In the Japanese restaurant in Seattle we could fill up on miso soup, rice and pickles for only 10¢...”

The part on “Alaska” (p. 355) is mostly about work in the canneries: “We shipped Japanese foods such as rice, soy sauce, miso, dried kelp [kombu] for soup base, dried sea slugs,... fu (a light cake made of wheat gluten), dried seaweed,...” Page 359 mentions soy sauce and miso soup with salmon.

The part on “Sawmills” states (p. 402): “The food was Japanese—first class rice imported from Japan,... and *koyadofu* (a dish made from bean curd). For breakfast they served miso soup with vermicelli in it. Lunch was rice, and fish and vegetables boiled hard with soy sauce.” On Sundays they had red bean soup with mochi (rice cake).

Under “Supplementary food” (p. 408-09): The meals were mostly Japanese. Breakfast: miso soup... Dinner: Sukiyaki. “Some people bought things from Seattle stores like bottles of pickled bean curd (*funyu*), salted sea urchin, fermented soy beans [natto], salted plums, or seaweed preserved by boiling in soy sauce (*nori no tsukudani*),...”

In 1907 we spent \$5 to \$6 per month for food, and it was poor. For breakfast we ate miso soup and rice;... for lunch rice cooked together with *aburage* (fried bean curd)... I bought canned salmon and poured soy sauce and sugar on it for dinner. For Saturday dinner we had sukiyaki.

Page 410: Breakfast was tofu in miso soup with pickles and rice. Page 411: Deer meat sukiyaki.

In the part on “Agriculture,” we read that Japanese immigrants to American sometimes enjoyed Japanese soyfoods. In about 1910, in Fife, a farming community near Seattle, in about 1910, Gunji Fujimoto “had miso soup and pickles for breakfast” (p. 440). In about 1916, in Hood River (northern Oregon), Henry Nakamura wrote that Japanese people could get foods from Japan, including “fried bean curd” (p. 499-500). There they also enjoyed miso soup for breakfast, cooked red beans [azuki] spread on bread for lunch, and rice, pickles, and dried radish strips cooked with soy sauce for dinner (p. 503). In the early 1920s in Oregon, breakfast typically consisted of rice, miso soup, and pickled cucumbers (Shoemon Nakamura, p. 512).

The part on “Mines” in 1917 (p. 557): “Dinner was Japanese style with stews, beef and tofu cooked together with soy, fish, miso soup, rice and so on.”

Page 568: “The meals at Endo camp were notorious. Breakfast was miso soup and pickles with rice. When the population increased, the amount of soup was increased by adding water, not miso. The contents of the soup were always wakame (seaweed)” all year long... “Mr. Endo laid in a huge stock of left-over seaweed and fried dried bean curd, and miso, soy sauce and pickles.”

Part 20, “On the Streets,” states that “The old Japanese towns in Seattle, Tacoma, Portland, and Vancouver (Canada) can hardly be traced today.” The author has tried to

reconstruct maps of these towns “in roughly the period of the 1920s, but not in any specific year” (p. 779-80). In Nov. 1908 Masanao Hanihara, Secretary of the Japanese Embassy, issued a report on his investigations of living conditions of Japanese in the western USA (p. 791). He found the Japanese still lived “at the level of immigrant laborers;” the conditions in their communities were “extremely low and chaotic.” “The Japanese in these areas hardly mix with white residents, while sometimes they approach or mix with Chinese. There are many ill effects from clique-ism.” “The majority of Japanese workers lack knowledge of English, so whenever they make contracts they sign papers blindly” (p. 795-96). Hanihara estimated the Japanese population of various states as follows: Washington 9,000 to 10,000, Oregon 3,500 to 4,500, Wyoming 1,000 to 1,500, Idaho 1,000 to 1,500, Montana 1,000, and Alaska 1,000. The largest Japanese community in the region was in Seattle (about 4,000 Japanese). “Shinzaburo Ban of Portland is almost the top among successful Japanese on the Pacific Coast.” His business, S. Ban Co., headquartered in Portland (where he arrived in 1891), acts mainly as a contract agency for Japanese laborers—a sort of employment agency, “and his store supplies sake, miso, soy sauce and other such Japanese foods and small items to the laborers” (p. 789-93; see portrait photo p. 792). A sidebar (p. 793, by Raisuke Tamura, Seattle) notes that “However long they lived in the United States, Japanese had to have Japanese food... Around 1906 I imported from Japan vegetables such as lotus root, Japanese radish [*daikon*], *gobo* (burdock), *zenmai* (fern), *abura-age* [deep-fried tofu pouches], *nigari* (bittern, a tofu coagulant), *tsukuneimo*, *yamaimo*, and so on, in hundred-pound baskets, and sold them to sawmills and railroad camps” (p. 793).

The 1 January 1916 edition the *Hokubei Nenkan* listed all businesses operating in various Japanese towns. These included two “tofu-makers” in Seattle, Washington (p. 800), at least one tofu maker in Tacoma, Washington (p. 804). Tacoma had a Japanese population of 931 in 1915—721 males and 210 females). Spokane didn’t have a Japanese town as in Seattle and Tacoma, but in 1915 it did have a Japanese population of 536 (462 males and 74 females).

The map of old-town Portland, Oregon, probably from about 1935, shows 90 Japanese businesses located between 1st Ave. and 7th Ave. (running north-south) and between W. Burnside and N.W. Glisan (running east-west). Among these are two tofu manufacturing companies. “Ota Tofu Mfg.” is located on 5th Ave. between Everett and Flanders. [Note: The actual address was 86½ 5th N]. “Fupei Tofu Mfg.” is located is on N.W. Davis between 3rd Ave. and 4th Ave.

Contents: The book is divided into 21 parts, with each part containing several chapters (the number is shown in parentheses): 1. Sailing (6). 2. Secret passage and ship-jumping (5). 3. Japanese exclusion (15). 4. Japanese women (2). 5. Railroads (5). 6. Alaska (4). 7. Sawmills (2). 8. Agriculture (7). 9. Hotels (2). 10. Restaurants (2). 11. Mines

(2). 12. Oysters (2). 13 Japanese language schools (2). 14. Studying English (3). 15. Pro-Japanese (8). 16. Furuya Company (4). 17. Lese majesty affairs (2). 18. Gambling (3). 19. Girls (2). 20. On the streets (9). 21. In Memoriam [Memoriam—to the many who died]. (2). Appendixes: (1) Partial list of Japan-U.S. and Japan-Canada sister cities. (2) Japanese consulates. (3) Chronological table: Japan and America (side by side), 1868-Sept. 1972. Bibliography (p. 967-72, mostly Japanese-language books). Epilogues: To English and to Japanese editions. Index of personal names (p. 988-1016). Address: Tokyo and Seattle, Washington.

620. Sundhagul, Malee; Daengsubha, W.; Suyanandana, P. 1973. Thua-nao: A fermented soybean food of northern Thailand. II. Improved method of processing. Bangkok: Applied Scientific Research Corp. of Thailand. 10 leaves. Traditional Processing Method, Research Project No. 38/3. 30 cm. [2 ref]

• **Summary:** Summary: Soak whole soybeans in water overnight. Drain off excess water. Steam under atmospheric pressure for 2 hours or at 15 psi for 40 minutes. Allow to cool to below 50°C. Inoculate with a 1% suspension of a bacterial culture of *Bacillus subtilis* N-8, isolated from native thua-nao, or with 20% by weight of freshly fermented soybeans. Incubate at room temperature for 36 hours or at 35°C for 24 hours. Dry at 65°C overnight. Grind into a powder—which is palatable.

From 1,000 gm of dry soybeans almost 900 gm of thua-powder was obtained. This powder contains more than 40% protein (one-third of which is soluble) and 20% fat on a dry weight basis. Address: Bio-Technology Group, Technological Research Inst., ASRCT, Bangkok, Thailand.

621. Sundhagul, Malee; Daengsubha, W.; Suyanandana, P. 1973. Thua-nao: A fermented soybean food of northern Thailand. III. Development of a low-cost high protein food. Bangkok: Applied Scientific Research Corp. of Thailand. 11 leaves. Traditional Processing Method, Research Project No. 38/3. 30 cm. [8 ref]

• **Summary:** An inexpensive high-protein food product, ferm-soy mix, has been developed by blending flavoring agents and a small proportion of high-grade fish meal into a soy protein base prepared from fermented whole soybeans. Such products can be made using simple, inexpensive equipment. Ferm-soy mix can be easily packed in polyethylene bags and stored at room temperature for long periods of time. “It is thought that fortification of the product with vitamins and minerals could be accomplished by simple mixing.”

The ferm-soy mix has flavor comparable to existing foods in common use locally. It could serve as a basic protein food among people who have low income and a low-protein diet.

The objective of this study was to demonstrate a

practical concept and approach. That is to help supply the nutritional needs of the people through better utilization of inexpensive local high-protein raw materials and not to develop a new product *per se*. This may offer an immediate solution to the problem of providing an inexpensive high-protein food to the people who need it most. Address: Bio-Technology Group, Technological Research Inst., ASRCT, Bangkok, Thailand.

622. Tanaka, Yonemi; Tomiyasu, Yukio. 1973. Nattô no hakushoku kenshoku-butsumo no kagaku-teki sosei [Chemical components of the white deposits of natto (fermented soybeans)]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 26(8):473-78. [5 ref. Jap]  
Address: Fukuoka Women's Junior College, Dazaifu-machi, Fukuoka.

623. Hartz (Jacob) Seed Company, Inc. 1973? Hartz seed. Stuttgart, Arkansas. 8 p. Undated. 28 cm.  
• **Summary:** Contents: Introduction. Arkansas' Grand Prairie: a major seed producing area for soybeans, rice and oats. Facilities. Research. Real estate and farm management. Export.

Jacob Hartz Sr. (1888-1963), pioneer in the development of soybean production in the South, founded Jacob Hartz Seed Company in 1926 [sic, 1942] and later that year built the first small seed cleaner in the State.

"More farmland in Arkansas is planted in soybeans than any other crop... Jacob Hartz Seed Company contracts upwards of one and one-half million bushels of Arkansas Certified "Blue Tag" Soybeans each year. This seed is produced by 150 Certified Seed Growers. The company's export operations have been directed into many areas of the Pacific, especially for natto, tofu, and miso in Japan.

Photos show: A portrait of Jacob Hartz, Sr. (p. 1) An early binder, pulled by a tractor, cutting oats. Modern combines harvesting soybeans. An aerial view of the plants elevators and offices in Stuttgart. Company President Jake Hartz, Jr. with Dr. Curtis Williams in one of the company's three greenhouses. Address: P.O. Box 946, Stuttgart, Arkansas 72160. Phone: 501-673-8565.

624. Ohkuro, Isamu; Suzuki, Kakuyoshi; Ito, S.; Komatsuzaki, T. 1974. Shokuin-yô saikin (nattô-kin, nyûsankan-kin) fuku kônai chûsha no hatsuka nezumi ni oyobosu eikyô [Influences of intraperitoneal injection of esculent bacteria (*Bacillus natto* and *Lactobacillus*) on the mouse]. *Igaku to Seibutsugaku (Medicine and Biology)* 88(2):115-20. Feb. 10. [10 ref. Jap]  
Address: Dep. of Microbiology, Tokyo Medical College, Tokyo; The Kohno Clinical Medical Research Inst., Tokyo. All: Japan.

625. Kushi, Michio. 1974. Natural agriculture and food

processing. *Michio Kushi Seminar Report (Brookline, Massachusetts)* No. 2. Feb. 12. p. 1-4. Edited by Ane & Mark Riegel.

• **Summary:** On Feb. 12 Mr. Kushi, a macrobiotic teacher, lectured on: Soybeans. Making tofu: Lemon juice and vinegar vs. nigari. Making natto.

For making tofu, Kushi recommends using nigari rather than lemon juice or vinegar, since the yang nigari balances the yin soybean.

The soybean, "according to our Unifying Principle of macrobiotics, belongs to the yin category. And if you are taking plenty of soybeans, then you become a fool... if you cook kombu together with soybeans, the taste is very good, and nutritionally it is a better balance."

Soybean milk is easy to make. It can often be a substitute for cow's or goat's milk. Soybean milk is yin. If you give this to a baby for a long period, the baby becomes very yin. It is better to give soybean milk for a short period. Address: Brookline, Massachusetts.

626. *Better Nutrition*. 1974. Food for thought. Feb. [1 ref]

• **Summary:** "The Overseas Development Council is calling for a Sino-American Soybean Research Institute for developing soybeans which will produce more beans per acre..."

"Unfortunately, our country uses most of its domestic supply of soybeans as food for poultry and cattle. In the Far East soybeans are used directly as food for people, which is, of course, much more sensible. Soybean protein is as nearly complete a protein as exists in vegetarian food. Combined with cereals or nuts at the same meal, soybean food offers complete protein very inexpensively at the rate of 11 grams for every serving of the cooked dried beans.

"Other soybean products available in our country are loaded with high quality protein: soy flour, with up to 47 per cent protein, soybean curd (a kind of cheese) with almost 8 per cent protein, *miso* and *natto* with 11 and 17 per cent protein respectively.

"Soybean milk products are equally nourishing where protein is concerned."

627. Goto, Kenzo. 1974. Nattô no nenshitsu-sei fumi seibun ni tsuite. I. Nattô zenshi-shitsu kôsei shibô-san sosei to shishitsu seibun no bunkaku [The lipid-origin in flavor constituents of natto. I. Fatty acid composition and fractionation of total lipids]. *Research Bulletin of the Obihiro Zootechnical University* 8(3):501-07. March. [12 ref. Jap; eng]

• **Summary:** No significant difference was found in the fatty acid compositions of the total lipids in natto (a fermented whole soybean products) and soybeans. The predominant fatty acids, in descending order of predominance, are linoleic acid, followed by oleic, linolenic, and stearic acid.

The total lipid profile has at least 8 components, the

main ones being triglycerides, free fatty acids, diglycerides, monoglycerides, and traces of polar lipid. Address: Lab. of General Chemistry, Obihiro Zootechnical Univ., Obihiro, Hokkaido, Japan.

628. Kiuchi, Kan; Ohta, Teruo; Fujiie, Hiroko; Ebine, Hideo. 1974. Daizu tansui kabutsu no kôso-teki bunkai ni kansuru kenkyû. I. *Bacillus subtilis* No. 17 no hemiseruraaze no seisei to seishitsu [Studies on enzymatic hydrolysis of soybean polysaccharides. I. Purification and properties of hemicellulase from *Bacillus subtilis* No. 17]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 29. p. 170-75. March. [22 ref. Jap; eng]

• **Summary:** Reprinted from *Nippon Shokuhin Kogyo Gakkaishi (J. of Food Science and Technology)* 19(12):585-90 (1972). Address: National Food Research Inst., MAFF, Tokyo, Japan.

629. Kameda, Yukio; Ouhiro, S.; Matsui, K.; Kanatomo, S.; Hase, T.; Atsusaka, T. 1974. Antitumor activity of *Bacillus natto*. V. Isolation and characterization of surfactin in the culture medium of *Bacillus natto* KMD 2311. *Chemical and Pharmaceutical Bulletin* 22(4):938-44. April. [11 ref]

• **Summary:** In order to find a strain which had the strongest cytolytic [dissolution or disintegration of cells] activity on Ehrlich ascites carcinoma cells (solid type), the authors isolated 113 strains of *Bacillus natto* from straw collected in various parts of Japan, and measured the cytolytic activity of each by the cylinder plate method. One strain, tentatively called KMD 2311, was found to have the strongest cytolytic activity. Two types of cytolytic substances were found in this enzyme. One was found to be identical with surfactin; it accounted for about 20% of the cytolytic activity. Address: Faculty of Pharmaceutical Sciences, Kanazawa Univ., 13-1 Takara-machi, Kanazawa, Japan.

630. Photograph of Michio and Aveline Kushi standing behind a workbench with a group of craftsmen at their newly purchased home at 62 Buckminster Rd., Brookline, Massachusetts. 1974.

• **Summary:** This photograph is from the Michio and Aveline Kushi Macrobiotics Collection, National Museum of American History, Smithsonian Institution, Washington, DC. Reprinted with permission of the Smithsonian.

Letter (e-mail) from Norio Kushi, son of Michio and Aveline Kushi. 2011. Jan. 17. The photograph is taken during the renovation of my parent's home at 62 Buckminster Rd. in Brookline, Massachusetts. Therefore it would have been sometime in the early months of 1974. I am guessing April 1974 soon after I returned from Japan. It is taken on the 2nd floor in what was to be my parent's bedroom.

"I only know the names of two of the people, far left is Claude Paeiment, who currently lives in Sutton, Quebec

(450-538-8399). After Claude returned to Quebec, where he was from, he opened the natural food store "Tau" and had a "macro" center in the same building.

"The person who is [second from the right], next to my mother [Aveline] is Bill Painter, who passed away many years ago. Bill Painter was close friends with "Uncle Charlie," Charles Kendall, who married my mother's sister, Yoko. Charlie and Yoko live in Worthington, MA and they make great natto. "Uncle" Charlie who was actually dating my sister Lily during this time, was part of the scene back during this time so he may know the names of the other two people in the photograph.

"Jimmy Silver of Los Angeles. 2011. Jan. 14. I recognize the faces of all the people but can only identify one by name: Bill Painter is second in from the right. He was also a dedicated shiatsu student of Shizuko Yamamoto and an excellent artist."

Letter (e-mail) from Evan Root. 2011. Jan. 15. "I believe this to be the renovation of 62 Buckminster Road, probably 1973 or perhaps 1974. Standing second from the right (on Aveline's left) is Bill Painter. He was the head carpenter for Seventh Inn, Noah Center and Buckminster Road. I think it would be fair to also call him the designer / contractor as well, as he would draw up the plans and assign the tasks, but he was also hands on, and he and the crew were all Kushi's students.

"As you may know, 62 Buckminster road was part of the former Cardinal Cushing residence and school. When the Kushis first bought it, there were huge, real slate blackboards built in, and commercial exit signs and so forth. Though they got it at a good price (\$100,000) just before condos were discovered, it required extensive renovation."

Claude Paeiment (Jan. 2011) was unable to identify the two unknown people. He said: "Those two guys were only helping for a short time at the Buckminster Road house. So many people were coming to help at the time." Claude lived in Boston for 3 years; he worked as a carpenter. He and Francine directed the study house in Newton, Massachusetts; 30 people lived there at the time. He remembers putting tiles on a low ceiling at Erehwon. Address: Brookline, Massachusetts.

631. Ohkuro, Isamu; Suzuki, Kakuyoshi; Ito, S.; Komatsuzaki, T. 1974. Nattôkin zenshori hatsuka nezumi no ôshoku budô kyûkin kansen-shi ni taisuru teikôsei [Resistance of mice pretreated with *Bacillus natto* to lethal challenge with *Staphylococcus aureus*]. *Igaku to Seibutsugaku (Medicine and Biology)* 89(1):35-40. July 10. [6 ref. Jap]  
Address: Dep. of Microbiology, Tokyo Medical College, Tokyo; The Kohno Clinical Medical Research Inst., Tokyo. All: Japan.

632. Ellis, John J.; Wang, H.L.; Hesseltine, C.W. 1974.



*Rhizopus* and *Chlamydomucor* strains surveyed for milk-clotting, amylolytic, and antibiotic activities. *Mycologia* 66(4):593-99. July/Aug. [11 ref]

• **Summary:** “Nine strains of *Chlamydomucor oryzae* and 347 strains of *Rhizopus*, representing 10 species, were grown in rice flour and wheat flour media. When grown on wheat flour medium, nearly all strains exhibited amylolytic activity and more than 300 strains showed milk-clotting activity. Almost all strains of *R. arrhizus* exhibited antibiotic activity against NRRL B-765 *Bacillus subtilis*. The 23 strains of *R. stolonifer* showed none of these activities. Renninlike proteinases from microorganisms have attracted interest in the past few years as possible substitutes for rennin in making cheese.” Address: NRRL, Peoria, Illinois.

633. Saito, Takahide; Iso, N.; Mizuno, H.; Kaneda, H.; Suyama, Y.; Kawamura, S.; Osawa, S. 1974. Conformational change of a natto mucin in solution. *Agricultural and Biological Chemistry* 38(10):1941-46. Oct. [30 ref]

• **Summary:** The mucin obtained from a natto sample was found to be composed of 58% gamma-polyglutamic acid and 40% polysaccharide. Address: Dep. of Food Science and Technology, Tokyo Univ. of Fisheries, Konan, Minato-ku, Tokyo, Japan.

634. Aihara, Herman. 1974. Soybean diet: Diet for the better protein. Oroville, California: George Ohsawa Macrobiotic Foundation. xi + 164 p. Nov. Illust. Index. 21 cm.

• **Summary:** This book is an expanded version of “Miso and Tamari” (1972). Contents: Preface. Introduction. 1. Theory: Steak vs. gasoline, is animal protein indispensable, protein requirements, essential amino acids—law of all or nothing, minimum daily requirement of essential amino acids.

2. Miso: Introduction, the origin of miso, kinds of miso, ingredients, how to make miso, value of miso, miso in the treatment of tuberculosis, how to make miso at home using mugi koji, recipes using miso for warmer seasons, recipes using miso for colder times.

3. Tamari or traditional soy sauce: History, chemical change of tamari, how to make tamari soy sauce at home, how to use soy sauce, soy sauce cooking for warmer times, soy sauce cooking for colder times.

4. The other soybean and high protein foods: How to make tofu at home, how to make tofu plaster, how to make agé—deep fried tofu at home, how to make seitan at home. 4A. Tofu, seitan, and gluten cooking for warmer times: How to make tofu, nigari, and bulk tofu at home, how to make wheat gluten, seitan and fresh wheat *fu* at home. 4B. Tofu, seitan and gluten cooking for colder times. Appendix: Cutting styles, useful information. Bibliography.

Large photos near front of book show: (1) Herman Aihara. (2) Cornelia Aihara looking very happy at her stove. Address: Oroville, California.

635. Ohkuro, Isamu; Suzuki, K.; Ito, S.; Komatsuzaki, T. 1974. Nattô-kin zenshochi ni yoru ôshoku budô kyûkin teikô hatsuka nezumi no momo to kessei-to no kôso [Enzymatic activity of the spleen and serum in mice with *Staphylococcus aureus* resistance induced by pretreatment with *Bacillus natto*]. *Igaku to Seibutsugaku (Medicine and Biology)* 89(6):383-88. Dec. 10. [10 ref. Jap]

Address: Dep. of Microbiology, Tokyo Medical College; and Kohno Clinical Medical Research Inst., Tokyo.

636. Azumaya, Naoki. 1974. Nattô-kin ni yoru bitamin B-2 seisan ni kansuru kenkyû. I. Co<sup>2+</sup>, Cu-2, Mn-2, Al-3 no eikyô [Study on vitamin-B production by natto bacteria. II. The effect of cobalt, copper, and manganese positive divalent ions, and of aluminum positive trivalent ion]. *Kumamoto Joshi Daigaku Gakujutsu Kiyo (J. of Kumamoto Women's University)* 26(1):12. [Jap]\*

637. Hayashi, U. 1974. [Study of the cause of increase in nitrogen content in the course of manufacture of natto. I. Preliminary experiments on fluctuations in total nitrogen during processing of *Bacillus natto* medium and during culture]. *Reports of Teikoku Joshi Daigaku Laboratory of Natto* 49:1-9. [Jap]\*

638. Hayashi, U. 1974. [Study of the cause of increase in nitrogen content in the course of manufacture of natto. II. Study of the method of estimation of nitrogen in soybean and soybean products]. *Reports of Teikoku Joshi Daigaku Laboratory of Natto* 49:10-20. [Jap]\*

639. Hayashi, U. 1974. [Study of the cause of increase in nitrogen content in the course of manufacture of natto. III. On the fluctuations in all-nitrogen with the growth of *Bacillus natto*]. *Reports of Teikoku Joshi Daigaku Laboratory of Natto* 49:21-29. [Jap]\*

640. Hayashi, U. 1974. [Study of the cause of increase in nitrogen content in the course of manufacture of natto. IV. Experiment to confirm the ability of *Bacillus natto* to utilize atmospheric nitrogen by means of stable isotope Nitrogen-15]. *Reports of Teikoku Joshi Daigaku Laboratory of Natto* 49:30-34. [Jap]\*

641. Hayashi, U.; Narasc, A.; Oura, Y. 1974. [Food hygienic studies on microbial contamination of eggs. Part II. Relation between use of feed comprising added natto and microbe in egg]. *Reports of Teikoku Joshi Daigaku Laboratory of Natto* 49:35-39. [Jap]\*

642. Kay, Theodore. 1974. Le soja dans le regime alimentaire Nigerien [Soybeans in the Nigerian diet]. See p. 19-24. Unpublished manuscript. [Fre]

• **Summary:** Contents: Suggestion for incorporation in

cooking: Soya bean paste and whole beans (not dehulled). Utilization of the paste: A. Directly (mix with flour of wheat or corn and beaten eggs to make deep-fried balls). B. To prepare soya bean milk: (a) From the paste with boiling water. (b) Using the Cornell method from soymilk. Use of the residue from preparation of soy bean milk [okara]: In biscuits, etc. Utilization of whole soya beans: baked, sweet baked powder, stew.

Recipes from the Mission of Toussiana (Upper Volta). 1. Sumbala, an aromatic product usually made from *néré* seeds was developed by the Centre Ménager [a family assistance center] of Toussiana. It is ready after 3 days. 2. Soymilk. 3. Soy fritters (deep fried balls made from soy flour, and seasoned with salt and pimento). 4. Soya Faros (a small white tuber whose nutritional value can be greatly improved if served with soy flour in a preparation steamed in leaves). 5. Soya *To*, a porridge made traditionally with sorghum and millet flour, but fortified with soy flour. Address: Inst. for Agricultural Research, Samaru, Ahmadu Bello Univ., PMB 1044, Zaria, Nigeria.

643. Buchanan, Robert E.; Gibbons, N.E. eds. 1974. Bergey's manual of determinative bacteriology. 8th ed. Baltimore, Maryland: The Williams & Wilkins Co. 1246 p. • **Summary:** In "Part 15: Endospore-forming rods and cocci" is a section (p. 529-33) titled "Genus I. *Bacillus* Cohn 1872, 174," by T. Gibson and Ruth E. Gibson. It discusses *Bacillus subtilis* and *Bacillus natto*. Both are in the family Bacillaceae, and in the genus *Bacillus*, whose members have rod-shaped cells, are aerobic or facultative, and usually produce the enzyme catalase. Page 533 (R.7) states: "Original cultures of *Bacillus natto* Sawamura 1906, 109 were found to be identical with *B. subtilis* by Smith et al. (1946)."

Page 1074 (L.4) gives the full citation for this 1946 publication as: Smith, N.R., Gordon, R.E.; Clark, F.E. 1946. Aerobic mesophilic sporeforming bacteria. *USDA Miscellaneous Publication* No. 559. p. 1-112.

644. Kobayashi, Keizō. 1974. *Shōjin ryōri nyūmon* [Entry gate to Zen vegetarian cookery]. Tokyo: Shibata Shoten. 230 p. Illust. 22 cm. [Jap]

• **Summary:** The author was born in 1930. Address: Formerly asst. head cook at Eiheiji Zen Monastery. Now head priest, Rinsho-ji, Tateoka, Murayama-shi, Yamagata prefecture.

645. Nihon tabemono hyakka [Encyclopedia of Japanese foods]. 1974. Tokyo: Shinjin Butsu Oraï-sha. [Jap]\*

646. Ashaye, T.I.; Asenime, I.O.E.; Afolabi, N.O.; Van Rheenen, H.A. 1975. Soybean production in Nigeria. *INTSOY Series* No. 6. p. 223-26. D.K. Whigham, ed. Soybean Production, Protection, and Utilization: Proceedings

of a Conference for Scientists of Africa, the Middle East, and South Asia (College of Agric., Univ. of Illinois at Urbana-Champaign). [13 ref]

• **Summary:** "Areas of production: Benue Province in Benue-Plateau State is a center of production, followed by the Abuja area in the North Western State and Southern Zaria Province in North Central State as minor production areas. The crop is produced in small holdings of 1 to 2 hectares per farmer, with an average yield of 600 to 800 kg/ha..."

"Most of the crop is sold to United Kingdom consumers. Italy, Hungary, and Western Germany are other markets for Nigerian soybeans.

"Most of the soybeans produced in Nigeria are exported as a cash crop, except for a few that are used for human consumption in some parts of the northern states. Yuwa (13) stated that the Gwarrin Genge around Diko have discovered that soybeans can be used for making 'daddawa' [dawadawa] in place of the usual locust bean. Also the Koros around Ija pound it into powder and use it in place of melon seed to thicken their soup. Recently, however, because of the prevalent kwashiorkor (acute protein deficiency syndrome) in many poor Nigerian children, there appears to be stimulated interest in the use of soybean for human food." Address: 1&3. Inst. of Agricultural Research and Training, Univ. of Ife, Ibadan, Nigeria.

647. Fujii, Hisao; Shiraishi, A.; Kaba, H.; Shibagaki, M.; Takahashi, S.; Honda, A. 1975. Itohiki nattō ni okeru ijō hakkō to nattō-kin fuaaji [Abnormal fermentation in natto production and *Bacillus natto* phages]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 53(7):424-28. July. [7 ref. Jap; eng]

Address: Faculty of Home Life Science, Fukuoka Woman's Univ., Kasumigaoka, Fukuoka, Japan.

648. Lovett, Paul S.; Bramucci, Michael G. 1975. Plasmid deoxyribonucleic acid in *Bacillus subtilis* and *Bacillus pumilus*. *J. of Bacteriology* 124(1):484-90. Oct. [23 ref]

• **Summary:** The authors found two plasmids from *Bacillus subtilis* strains; they named them pMB1 and pMB2 and gave the molecular weight of each. The plasmids were present in several copies per chromosome.

Since the word "natto" does not appear in this article, the writers may well have been unaware that *Bacillus subtilis* has long been used in Japan to produce a popular fermented food from soybeans—natto.

Although the function of these plasmids has not been determined, the authors suggest the usefulness of these plasmids for the construction of recombinant DNA molecules.

Contains 7 figures, including 5 graphs and 2 electron micrographs of plasmids pMB1 and pMB2 (with a bar showing their approximate size in micrometers).

Note: This is the earliest document seen (Jan. 2012) that

contains the word “plasmids” (or plasmid) in connection with the bacterium *Bacillus subtilis* which causes the natto fermentation. Address: Dep. of Biological Sciences, Univ. of Maryland Baltimore County, Catonsville, Maryland 21228.

649. Tovar Galvez, Luis Raul. 1975. Productos derivados del frijol soya tecnologías tradicionales en el Lejano Oriente [Traditional technology soy products in the Far East]. In: American Soybean Assoc., ed. 1975. *Memorias: Primera Conferencia Latinoamericana Sobre la Proteína de Soya*. Mexico City. 232 p. See p. 185-93. [14 ref. Spa]

• **Summary:** Descriptions of and flow sheets for the production of the following basic soyfoods are given: Miso, shoyu (*salsa de soya*), natto, tempeh, sufu (fermented tofu), and soy yogurt. A table shows the nutritional composition of each of these foods as well as yuba and kori-tôfu (dried-frozen tofu).

Note 1. This is the earliest Spanish-language document seen (Sept. 2011) that mentions tempeh, which it calls “tempeh.”

Note 2. This is the earliest Spanish-language document seen (Feb. 2004) that uses the term “kori-tôfu” to refer to dried-frozen tofu. Address: Facultad de Química, UNAM, Mexico.

650. Shurtleff, William; Aoyagi, Akiko. 1975. The book of tofu: Food for mankind. Hayama-shi, Kanagawa-ken, Japan: Autumn Press. 336 p. Illust. by Akiko Aoyagi. Index. Dec. 28 cm. Rev. ed. 1977 Autumn Press, Brookline, MA. [53 ref]

• **Summary:** This pioneering work started the “tofu revolution” in America. Contents: Preface. Acknowledgements. Part I. Tofu: Food for mankind. 1. Protein East and West. 2. Tofu as a food: Introduction, rich in high quality protein (NPU, biological value, protein score, amino acid content), high protein complementarity (tofu contains an abundance of lysine, an essential amino acid that is deficient in many cereal grains; increase usable protein by combining tofu with wheat, rice, corn, etc.), easy to digest, an ideal diet food, low in saturated fats and free of cholesterol, rich in vitamins and minerals, a health-giving natural food, backbone of the meatless / vegetarian diet, free of chemical toxins, low in cost, easily made at home, quick & easy to use, versatile.

3. Getting started: Introduction, buying and storing tofu, basic ingredients (whole-wheat flour, miso {rice-, barley-, and soybean miso, special Japanese miso, Chinese chiang}, oil, brown rice, salt, shoyu {natural shoyu, shoyu, Chinese soy sauce, synthetic or chemical soy sauce}, sugar, vinegar, monosodium glutamate {MSG}), Japanese kitchen tools (each illustrated), preparatory techniques (salt rubbing, rinsing and pressing leeks and onions, soaking burdock root, reconstituting dried sea vegetables {dried hijiki, wakame, agar}, wheat gluten and kampyo [kanpyo], parboiling, cutting tofu and vegetables, using sesame seeds, toasting

nori, preparing a steamer), basic recipes (soup stocks and broths {dashi}, basic shoyu dipping sauces {*tsuke-jiru*}, miso toppings {sweet simmered miso / *nerimiso*, miso sauté / *abura miso*, special miso toppings and dipping sauces, finger lickin’ miso, and regular miso}, miso salad dressings, nut and seed butter toppings, spreads and dressings, basic sauces, rice, noodles and other basic preparations).

Our favorite tofu recipes (lists about 80 recipe names for each of the different types of tofu, plus soymilk, yuba, whole soybeans, gô, okara, and curds; very favorites that are also quick and easy to prepare are preceded by an asterisk).

Part II. Cooking with tofu: Recipes from East and West (500 recipes). 4. Soybeans: History of soybeans and “soybean foods,” cooking with whole dry soybeans, roasted soybeans (*iri-mame*), fresh green soybeans (*edamame*, incl. a recipe for “Sweet emerald bean paste {*Jinda*}),” kinako (roasted full-fat soy flour, incl. Japanese health food treats such as *kinako amé*, *gokabo*, *kokusen*, *kankanbo*, and *abekawa mochi*), soybean sprouts (*daizu no moyashi*), natto (“sticky fermented whole soybeans,” with “gossamer threads”), tempeh (fermented soybean cakes), Hamanatto and Daitokuji natto (raisin-like natto), modern western soybean foods (natural soy flour [full-fat], soy granules, defatted soy flour and grits, soy protein concentrates, soy protein isolates, spun protein fibers, textured vegetable protein {TVP}, soy oil products). 5. Gô (a thick white puree of well-soaked uncooked soybeans). 6. Okara or Unohana. 7. Curds and whey. 8. Tofu (includes history, and preparatory techniques: Parboiling, draining, pressing {towel and fridge method, slanting press method, sliced tofu method}, squeezing, scrambling, reshaping, crumbling, grinding, homemade tofu, tofu quick and easy {incl. Chilled tofu–*Hiya-yakko*}, tofu dressings, spreads, dips and hors d’oeuvre {incl. Tofu mayonnaise dressing, Tofu tartare sauce, Tofu cream cheese, Tofu sour cream, Tofu cottage cheese, Tofu guacamole}, tofu in salads {Western style and Japanese style salads incl. *Shira-ae*}, tofu with sandwiches and toast, tofu in soups {Western style and Japanese style soups, incl. miso soup}, tofu in sauces, tofu in breakfast egg dishes, tofu baked, tofu sautéed, stir-fried or topped with sauces {incl. *Mabo-dofu* [Ma Po doufu]}, deep-fried tofu, tofu with grains, tofu broiled {incl. *Tofu dengaku*}, tofu simmered in one-pot cookery and seasoned broths, tofu steamed, tofu desserts {incl. Tofu whipped cream or yogurt, Banana tofu milkshake, Tofu icing, Tofu ice cream, Tofu cheesecake, Tofu-peanut butter cookies}).

9. Deep-fried tofu: Thick agé or nama agé or atsu agé, ganmo or ganmodoki (incl. *hiryozu / hirosu*), agé or aburagé (incl. “Smoked tofu,” p. 197). 10. Soymilk. 11. Kinugoshi (“*Kinu* means ‘silk’; *kosu* means ‘to strain’; well named, kinugoshi tofu has a texture so smooth that it seems to have been strained through silk.” It is made from concentrated soymilk). 12. Grilled tofu (incl. *sukiyaki*). 13. Frozen and dried-frozen tofu. 14. Yuba (incl. many meat alternatives

such as Yuba mock broiled eels, Buddha's chicken, Buddha's ham, sausage). 15. Tofu and yuba in China, Taiwan, and Korea (incl. Savory tofu {*wu-hsiang kan*}; see p. 258 for illustrations of many meat alternatives, incl. Buddha's fish, chicken, drumsticks, and duck, plus vegetarian liver and tripe, molded pig's head, and molded ham). One type of Korean soybean miso is called *kotsu jang* [sic, *kochu jang*]. When tofu is served with miso [Korean-style, *Tenjang*] as the dominant seasoning, and with rice, "it becomes the popular *Tenjang Chige Pekkem*" (p. 262). 16. Special tofu.

Note 1. This is the earliest (and only) English-language document seen (March 2009) that uses the word "Tenjang" to refer to Korean-style soybean jang (miso).

Part III—Japanese farmhouse tofu: Making tofu for more and more people. 17. The quest. 18. Making community tofu. 19. The traditional craftsman. 20. Making tofu in the traditional way.

Appendices: A. Tofu restaurants in Japan; many are vegetarian: In Tokyo: Sasa-no-yuki / Sasanoyuki, Goemon, Hisago, Sanko-in, Shinoda-zushi, Dengaku (south of Tokyo in Kamakura). In Kyoto: Nakamura-ro, Okutan, Takocho, Izusen, Junsei, Nishiki, Hakuun-an, Rengetsu, Sagano, Sorin-an. Tea ceremony cuisine (*Kaiseki ryori*), Zen temple cookery or Buddhist vegetarian cookery (*Shojin ryori*), Tea ceremony cookery from China (*Fucha ryori*), Wild gathered cookery (*Sansai ryori*). A directory of these and others, with addresses and phone numbers, is given (p. 312).

B. Tofu shops in the West (Directory of 43 shops in the USA, 3 in Europe, and 3-7 in Latin America {Mexico City, Rio de Janeiro and Sao Paulo, Brazil}). C. People and institutions connected with tofu. D. Table of equivalents. Bibliography. Glossary. Index. About the authors (autobiographical sketches; a photo shows Shurtleff and Aoyagi, and gives their address as New-Age Foods Study Center, 278-28 Higashi Oizumi, Nerima-ku, Tokyo, Japan 177). Sending tofu in the four directions.

Pudding recipes include: Rice pudding with gô and apple (p. 76, incl. 2 cups soymilk). Tofu chawan-mushi (p. 147; Steamed egg-vegetable custard with tofu). Tofu fruit whips (p. 148). Tofu rice pudding (p. 150, incl. 1 cup soymilk). Tofu custard pudding (p. 152). Soymilk custard pudding (p. 208). Brown rice pudding (p. 208, with 2 cups soymilk). Soymilk chawan-mushi (p. 209). Chawan-mushi with yuba (p. 249).

Dessert recipes include: Tofu whipped cream or yogurt (p. 148; resembles a pudding or parfait). Tofu ice cream (p. 149, with chilled tofu, honey, vanilla extract and salt). Banana-tofu milkshake (p. 149). Tofu cream cheese dessert balls (p. 149). Tofu icing (for cake, p. 149). Tofu cheesecake (p. 150). Tofu-pineapple sherbet (p. 151). Also: Soymilk yogurt (cultured, p. 205). Healthy banana milkshake (p. 206). On p. 160 is a recipe for "Mock tuna salad with deep fried tofu."

Note 2. This is the earliest English-language document

seen (March 2007) that uses the term "Tofu ice cream" to refer to soy ice cream or that contains a recipe for "Tofu ice cream."

Note 3. This is the earliest English-language document seen (March 2000) that uses the term "Tofu Cheesecake" and the first to give a recipe for a tofu cheesecake.

Note 4. This is the earliest English-language document seen (May 2000) that uses the term "Tofu Sour Cream" (p. 109) or that contains a recipe for "Tofu Sour Cream."

Note 5. This is the earliest English-language document seen (Dec. 2003) that uses the term "tofu milkshake" or that gives a recipe for a shake made with tofu.

Note 6. This is the earliest English-language document seen (Jan. 2012) that uses the term "sticky fermented" to refer to natto.

Note 7. This is the 2nd earliest English-language document seen (Nov. 2011) that uses the term "dried-frozen tofu."

Note 8. This is the earliest English-language document seen (March 2004) that describes preparatory techniques for tofu (p. 96-98).

Note 9. This is also the earliest English-language document seen (March 2004) that contains the term "smoked tofu."

Note 10. This is also the earliest English-language document seen (March 2004) that uses the term "kinugoshi tofu" to refer to silken tofu.

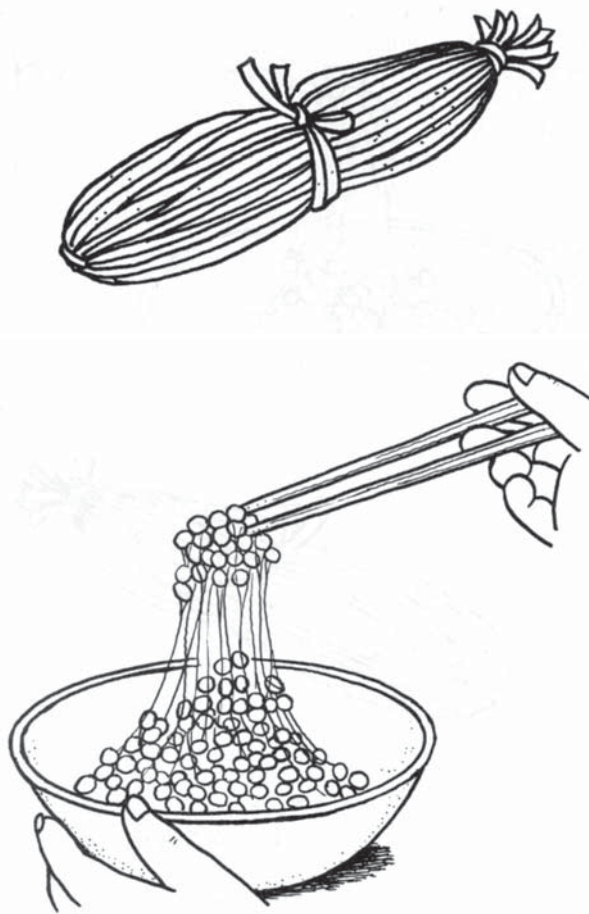
Note 11. As of March 2007, the various English-language editions of this book have sold more than 616,000 copies.

Note 12. This is the earliest English-language document seen (June 2011) that uses the term "tofu lees" to refer to okara (see p. 22, 77).

Note 13. This is the earliest English-language document seen (Aug. 2011) that contains the term "Modern Western soybean foods" (see p. 69), a term that Shurtleff would soon (by 1983) replace by the more accurate "Modern soy protein products." Address: c/o Aoyagi, 278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan. Phone: (03) 925-4974.

651. Shurtleff, William; Aoyagi, Akiko. 1975. Natto (sticky fermented whole soybeans) (Document part). In: W. Shurtleff and A. Aoyagi. 1975. *The Book of Tofu*. Hayama-shi, Kanagawa-ken, Japan: Autumn Press. 336 p. See p. 67-68.

• **Summary:** "Natto are prepared (commercially or at home) by steaming soaked soybeans until they are soft, inoculating the warm (104°F) beans with the bacteria *Bacillus natto*, and then allowing them to ferment for 15 to 24 hours in a humid environment at about 104°F. The dark-brown beans have a fairly strong and unusual aroma and flavor, and a sticky, slightly slippery surface texture. When lifted from the bowl with chopsticks (fig. 13), like some varieties of melted cheese, they form gossamer-like threads. Although most whole soybeans are somewhat difficult to digest, natto



are highly digestible because the beans' complex protein molecules have been broken down by the bacteria during fermentation. A whole, natural food, natto contains 16.5 percent protein and are rich in vitamins B-2, B-12, and iron. In Japan and in Japanese grocery stores in the West, natto are sold in small (3 to 4 ounce) packages wrapped in straw, from which they traditionally received bacteria for fermentation. Generally served as a topping for rice, natto are also used in miso soups and *Aemomo*-dressings, or sautéed with vegetables. In the provinces, they are mixed with a little sugar and served as an hors d'oeuvre. About 50,000 tons of soybeans are made into natto each year in Japan, about one-fourth the amount used to make either miso or shoyu."

Recipes are given for: Natto topping for brown rice. Natto miso soup. Illustrations show: (1) Natto wrapped in rice straw during the soybean fermentation. (2) Natto's gossamer threads.

Note: This is the earliest document seen (Oct. 2010) that uses the word "sticky" or the term "sticky fermented whole soybeans" to describe Japanese natto. Address: Lafayette, California.

652. Shurtleff, William; Aoyagi, Akiko. 1975. The book

of tofu: Food for mankind (Illustrations—line drawings). Hayama-shi, Kanagawa-ken, Japan: Autumn Press. 336 p. Illust. by Akiko Aoyagi. Index. Dec. 28 cm. Rev. ed. 1977 Autumn Press, Brookline, MA. [53 ref]

• **Summary:** Continued: Illustrations (line drawings, both numbered and unnumbered) show: A hearth in a traditional Japanese farmhouse with tofu dengaku roasting around a bed of coals in a sunken open-hearth fireplace. An old Japanese plum tree blossoming in winter. Three pieces of skewered tofu dengaku with a sansho leaf atop each in a special serving box. A sprig of sansho with berries. Stylized top of a soybean plant in a circle. Fig. (4) Tofu products available in the West (tofu, dofu, kinugoshi, thick agé triangles, cubes, and cake, agé and age puffs, hollow agé cubes, soymilk, tofu pudding, doufu-ru {white and red}, ganmo {patties, small balls, and treasure balls}, grilled tofu, dried-frozen tofu, instant powdered tofu, okara, dried yuba, soymilk curds, pressed tofu, savory tofu). A wooden cutting board and Japanese broad-bladed vegetable knife (nagiri-bôcho) with vegetables and tofu on a woven bamboo tray. (8) A wooden keg of red miso and a plastic bag of barley miso. (9) Shoyu in a metal can, wooden keg, glass bottle, and table-top dispenser. Traditional Japanese kitchen tools: *Miso-koshi* (woven bamboo strainer used in making miso soup). cutting board, Japanese vegetable knife, wooden spatula, bamboo rice paddle (*shamoji*) and spoon, woven bamboo colander or tray (*zaru*), suribachi, Japanese grater (*oroshi-gané*), sudaré (bamboo mat), pressing sack for tofu or soymilk, serrated tofu-slicing knife, tawashi scrub-brush (made of natural palm fiber), wok with draining rack and wooden lid, stir-frying ladle and spatula, long cooking-chopsticks, mesh skimmer, deep-frying thermometer, Chinese bamboo steamer (*seiro*), charcoal brazier (*konro, shichirin*), broiling screen. Covered pot steamer. Small lidded pottery pot. More kitchen tools (p. 50-51). (10) A soybean measuring box (*isshô-bako*). (11) The soybean plant. Two views of a soybean seed with seed coat, hilum, and hypocotyl labeled. A bag full of soybeans. Roasted soybeans in a woven bamboo tray (*zaru*). Edamamé in the pods. Three shapes of kinako treats. Soybean sprouts. Natto on a bamboo mat (*sudare*). Natto wrapped in rice straw as it ferments. A hand holding chopsticks that lift natto up from a bowl of natto—connected by gossamer threads. Tempeh (round and square pieces). Wrapping a small packet of inoculated soybeans to make tempeh. (15) Two Japanese women in traditional clothing using hand-turned grinding stones (quern) to grind soaked soybeans when making tofu. (16) Push-pull grinding stones. (17) Motor-driven grinding stones. (18) Water-powered millstones. (19) Wind-powered millstones. (20) Unohana. (21) A tofu maker sitting on a traditional lever press that presses soymilk from the okara in a pressing sack on a rack. A heavy iron skillet. (22) Folding okara omelet pouches. Okara doughnuts. (23) A bamboo colander. (24) A tofu maker weighting a colander with a brick so that whey will collect in it. (25) Ladling whey from

curds; it foams! (27) A horse drinking whey from a wooden vat. Soymilk curds in a bamboo mat. (28) Ladling curds for Awayuki. (29) Fresh tofu in a plastic tub. (30) A tofu maker placing a weight on pressing lids as tofu is pressed in settling boxes (forming boxes). Transferring tofu-filled settling box to sink. Cutting a block of tofu into cakes under water. Eggplant halves in a yin-yang dance. Preparatory techniques used with tofu (slanting press, sliced tofu, squeezing, scrambling, reshaping, crumbling). (32) Utensils for making tofu at home. (33) Three designs for a homemade settling container. (34) Preparing homemade tofu (a-l). (35) Removing tofu from a farmhouse-style settling container (forming box). (36) Chilled tofu. Iceberg chilled tofu. A hot, moist, white towlette (*o-shibori*) is used to wipe the face and hands before (or occasionally after) a meal. Tofu salads in three Japanese pottery dishes. Japanese soups in three types of containers. (37) Chrysanthemum tofu. (38) Tofu poached egg. Tofu-stuffed green peppers. A wok. (39) Filling a wok with oil. (40) testing oil temperature in a wok. (41) Deep-frying tofu tempura—and (42) Serving it in a shallow bamboo basket. (43) Making *Kaki-agé*. (44) Dengaku Hoshi (from *Tofu Hyaku Chin*). (45) Skewered Tofu dengaku. Preparing Tofu dengaku in old Japan (from Hokusai's sketchbooks). (46) A variety of skewers. (47) Chinese firepots. (48) A Simmering Tofu wooden serving container heated by coals from within. (49) Miso oden. (50) Tofu wrapped in rice straw. (51) Nanzenji wrapped tofu. (52) Gisei-dofu. (53) Serving freshly deep-fried agé. (54) The deep-frying area of a traditional tofu shop. (55) Deep-frying tools. (56) Wooden bamboo tray with raised sides. Chinese cleaver. (57) Nori-wrapped sushi with agé (making and serving; six drawings). Eating noodles from old Japan (from Hokusai's sketchbook). (58) Preparing homemade noodles. (59) The Oden man on a winter's eve. A pottery bowl of Oden. Kombu rolls. (60) Making konnyaku twists. (61) Nishime in a multi-layered lacquerware box. (61) Pressing tofu for thick agé in a tofu shop. (62) Deep-frying tofu for thick agé. (63) A tofu maker with deep-fried thick agé triangles on screen trays. (64) Stuffing thick agé. (65) Thick agé stuffed with onions. (66) Pressing tofu for ganmo. (67) Adding seeds and vegetables. (68) Deep-frying ganmo. (69) A farmhouse open-hearth fireplace with nabe kettle. (70) Preparing homemade ganmo. Ganmo balls in a draining tray. Ganmo cheeseburger. (71) Cutting tofu to make agé slices (*kiji*). (72) Deep frying agé. (73) Opening agé into pouches. Agé treasure pouches. (74) Agé pouches sealed with foodpicks. Inari shrine with Shinto torii. (75) Kampyo-tied pouches. (76) Making rolled agé hors d'oeuvre. (77) Tofu maker ladling gô into a cauldron. (78) Stirring down the gô. Pressing soymilk from okara with a hand-turned screw press. (79) Serving fresh soymilk in a tofu shop. Six Japanese commercial soymilk products. Little girl at The Farm (Summertown, Tennessee) seated on a small chair drinking a cup of soymilk. Chinese breakfast soymilk soup with deep-

fried crullers (*Siento-chiang with yu-chiao tsaο pi*). (80) Takigawa-dofu. (81) Tofu maker pouring the soymilk for kinugoshi tofu. (82) Adding solidifier. (83) Trimming kinugoshi from sides of box. (84) Modern lactone kinugoshi (with GDL). (85) Modern kinugoshi factory. (86) Sasa-no-Yuki's Gisei-dofu container. (87) Kinugoshi with ankake sauce. The entrance way to a traditional Japanese restaurant featuring tofu. Traditional metal skewer for making grilled tofu. (88) Traditional tofu maker grilling tofu over a charcoal brazier (*hibachi*). Grilling tofu in a traditional open hearth. (89) An early method of elaborate grilling. Pieces of tofu on different types of skewers. Farmhouse sukiyaki with grilled tofu. (90) Tying frozen tofu with rice straw. (91) Drying farmhouse frozen tofu. (92) Pressing frozen tofu at home. (93) Deep-fried frozen tofu with cheese. (94) Making deep-fried frozen tofu sandwiches (*Hakata-agé*). (95) Frozen tofu wrapped in kombu. (96) Steaming table in a yuba shop. Ten different types / shapes of yuba. (97) Lifting yuba away from soymilk. (98) Yuba sashimi. (99) Yuba envelopes. (100) Deep-fried yuba dengaku. (101) Folding yuba into bundles. Trimming half-dried yuba from a skewer. (102-113) Tofu and yuba in Taiwan, China, and Korea (see separate record). Sesame tofu in pottery bowl. (114) Traditional farmhouse tofu, tied into a package with rice straw rope. (115) Shirakawa-go farmhouses with water-powered rice-dehusker in foreground. (116) Making seawater tofu at Suwanose. Mortar and pestle for pounding mochi. Making community tofu: Western metal hand mill, hand-turned stone mill apparatus, faces of upper and lower stones, colander and cloth, two shapes of cooking pots, Japanese farmhouse earthen cooking stove, cooking pot set on cut-off oil drum, ladle, two wooden paddles, pressing rack, pressing okara, lever press, pressing sack, wooden settling [forming] container with cloths. (117) Making nigari with salt in bamboo colander, a traditional "salt boat" for refining salt of nigari. (119) Country farmhouse tofu (5 illust.). (121) Morning shopping at a tofu shop. (122) Diagram of a tofu-shop floor plan. (123) Modern pressure with hydraulic press. (124) Modern centrifuge with 3 soymilk barrels. Thirty-one unnumbered illustrations showing every step in making and selling tofu in a traditional Japanese shop (p. 299-306). (125) Lady cutting tofu for Dengaku (from *Tofu Hyaku Chin*). (126) Ladies busy making dengaku (from *Tofu Hyaku Chin*). (127) Hearth at Nakamura-ro. (128) The garden at Okutan. Six types of Japanese sea vegetables: Hijiki, aonori, wakame, agar, nori, kombu. (129) Japanese vegetables (27 illustrations). Address: c/o Aoyagi, 278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan. Phone: (03) 925-4974.

653. Shurtleff, William; Aoyagi, Akiko. 1975. The book of tofu: Food for mankind (Recipes and food types with Japanese names). Hayama-shi, Kanagawa-ken, Japan: Autumn Press. 336 p. Illust. by Akiko Aoyagi. Index. Dec. 28 cm. Rev. ed. 1977 Autumn Press, Brookline, MA. [53 ref]

• **Summary:** Teriyaki sauce (p. 48). Ankake sauce (p. 49). Sushi rice (Rice in vinegar dressing, p. 51). Gomashio (Sesame salt). Gari (Sweet vinegared gingerroot, p. 51). Budomame (Sweet soybeans, p. 62). Kombu mame, kuro mame, gomoku mame (p. 62). Iri-mame (Roasted soybeans, p. 63). Edamame (Fresh green soybeans, p. 63). Jinda (Sweet emerald bean paste [made with edamame], p. 64). Kinako (Roasted full-fat soy flour, p. 64). Abekawa mochi (with kinako, p. 65). Kinako amé or genkotsu amé (Kinako candy, p. 66). Daizu no moyashi (Soybean sprouts, p. 67). Natto (Sticky fermented whole soybeans, p. 67). Hamanatto and Daitokujinatto (also spelled Daitokuji-natto) (Raisin-like natto, p. 69). Gô (Fresh soy purée, p. 70+). Gôjiru (Thick miso soup with gô, p. 74). Bakudan agé (Deep-fried gô patties, p. 76). Okara or onohana (p. 77+).

Unohana-jiru (Chilled okara soup, p. 79). Unohana no iri-ni (Okara & vegetable sauté, p. 81). Unohana-iri (Unsweetened fried okara, p. 82). Unohana dango (fried okara patties, p. 82). Sushi okara chakin (Okara omelet pouches, p. 84). Oboro (curds, p. 87). Oboro-dofu (Warm soymilk curds, p. 90). Awayuki (homemade curd dumplings, p. 90). Karashi-dofu (Curd dumplings with mustard, p. 90). Gomoku-dofu (Five-color tofu, p. 105). Hiya-yakko (Chilled tofu, p. 105). Menoha-dofu, nameko-dofu (p. 106). Ryanbandoufu (Chinese-style chilled tofu, p. 107). Imokake-dofu (Chilled tofu with glutinous yam and egg, p. 107). Tofu no misozuke (Tofu pickled in miso, p. 110). Kanten-dofu (Jelled tofu, p. 114). Aemono and Shira-ae (“White salad,” p. 114+, 160). Arare no aemono (Hailstones salad, p. 115). Suimono (Clear soup, p. 119). Kikka-dofu (Clear soup with chrysanthemum tofu, p. 120). Kenchin-jiru (p. 120). Tamago-toji (Japanese-style tofu, eggs & onions). Nanjen-dofu or Iritsuke-dofu (Chinese-style egg tofu, p. 123). Kenchin-yaki (p. 126). Iridofu [Iri-dofu] (Crumbly scrambled tofu, p. 128). Mabo-dofu [Ma po doufu] (Chinese-style tofu with red pepper sauce, p. 128). Hao-yu doufu (Chinese style oyster sauce & tofu, p. 129). Fanchie-dofu (Chinese-style tofu & tomatoes, p. 129). Tofu no kara-agé (Crisp agé slices, p. 131). Unagi-dofu (Tofu mock eels, p. 132). Kaminari agé (Thunderbolt tofu, p. 132). Agédashi-dofu [Agedashi-dofu] (Deep-fried tofu in dipping sauce, p. 133). Tendon (Deep-fried tofu with rice and broth, p. 133). Tofu furai (Breaded tofu cutlets, p. 134). Tempura (and batter and dipping sauce, p. 134). Zosui or Ojiya (Rice gruel, p. 138). Tofu dengaku (p. 139). Tofu teriyaki (p. 141). Yudofu or Tofu no mizutaki (Simmering tofu, p. 142). Nabeyaki-udon, Nabeyaki-soba, Udon-tsuki (p. 144). Yosenaabe (p. 144). Miso oden (p. 145). Yukinabe (The snow pot, p. 148). Niyakko (p. 145). Tsuto-dofu or Komo-dofu (Simmered tofu wrapped in rice straw, p. 146). Tofu chawan-mushi (Steamed egg-vegetable custard, p. 147). Nanzen-ji no Tsusmi-dofu (Nanzen-ji wrapped tofu, p. 147). Yuzu-gama (Yuzu treasure pot, p. 147). Naruto-dofu (Tofu spiral in butterbur leaves, p. 147). Gisei-dofu (Tofu cheesecake-like dessert, p. 152). Datémake [Datemaki]

(Tofu-egg roll, p. 153). Noppei-jiru (Noppei soup, 163). Kinpira (Agé with carrots and burdock root, p. 167). Yaki-soba (Fried buckwheat noodles with deep-fried tofu, p. 168). Chahan or yaki-meshi (sizzling rice with deep-fried tofu, p. 168). Soboro (p. 169). Norimaki-zushi (Nori-wrapped sushi with agé, p. 170). Kitsune domburi (Fox domburi, p. 172). Kitsune soba or udon (Fox noodles, p. 172). Yamakake soba (Buckwheat noodles with grated glutinous yam and agé, p. 172). Hiyashi-soba (Noodles & deep-fried tofu in chilled broth, p. 172). Nikomi udon (Ganmo simmered with homemade noodles and miso, p. 173). Kabayaki or Yaki-Shinoda (Agé mock broiled eels, p. 174). Oden (p. 175-78). Nishime (p. 178-79). Horoku-yaki (Thick agé stuffed with onions, p. 183). Hiryoza (Ganmo treasure balls, p. 188). Inari-zushi (Vinegared sushi rice in sweetened agé pouches, p. 194). Fuku-bukuro (Agé treasure pouches with crunchy vegetables, p. 195). Takara-zutsumi (Sacks of gold, p. 195). Shinoda-maki (Matchstick vegetables wrapped in age pouches, p. 195). Kinchaku and takara-bukuro (Drawstring purses and treasure bags, p. 196). Hasami-age (Mashed potatoes deep-fried in agé pouches, p. 196). Shinoda-maki (Agé cabbage rolls, p. 197). Shinoda mushi (Steamed agé with tofu and vegetables). Soymilk chawan-mushi (p. 209). Yose-dofu (Jelled and molded soymilk dishes, p. 209). Takigawa-dofu (Swirling jelled soymilk, p. 210). Shikishi-dofu (Kinugoshi custard, p. 216). Kinugoshi dishes from Sasa-no-yuki (p. 217-19): Hiya-yakko, yuzumiso-dofu, gisei-dofu, ankake-dofu, kijoyu, chiri-meshi, kuya-dofu or kuya-mushi, iridofu. Yaki-dofu (p. 220). Sukiyaki (p. 224-25). Koya-dofu or kori-dofu (Dried-frozen tofu, p. 226+). Tamago-toji (Frozen tofu with eggs and onions, p. 231). Gyoza [Chinese jiaozi] (p. 232). Oranda-ni (Deep-fried frozen tofu in lemon sauce, p. 234). Soboro (Grated frozen tofu rice topping, p. 234). Hakata-agé (Deep-fried frozen tofu sandwich, p. 235). Koya-dofu no kombu maki (Frozen tofu wrapped in kombu, p. 236). Sanshoku gohan (Three-color brown rice, p. 236). Fukuyose-ni (Frozen tofu simmered in sweetened broth, p. 236). Abekawa-dofu (Frozen tofu rolled in sweetened kinako, p. 237). Yuba (p. 238-42). Nama-yuba (Fresh yuba). Nama-gawaki or han-gawaki yuba (Half-dried yuba). Kanso- or hoshi-yuba (Dried yuba). Hira- or taira-yuba (Flat yuba sheets). Maki-yuba (Fresh yuba rolls). Komaki (Long yuba rolls). Kiri-komaki (Small yuba rolls). Musubi-yuba (Tied yuba). Omaki-, futomaki- or Uzumaki-yuba (Large yuba spirals). Oharagi yuba (Slightly flattened yuba roll tied with a thin piece of kombu). Amayuba (Sweet yuba). Kirehashi (Fresh yuba trimmings). Kuzu-yuba or mimi (Yuba flakes). Toyuba (Trough-shaped yuba, p. 242). Kaori yuba (Sweet miso deep-fried in fresh yuba, p. 244). Yawata-maki (Yuba-burdock root roll, p. 245). Toji yuba (deep-fried yuba with ginkgo nuts and lily bulbs, p. 245). Yuba no kabayaki (Yuba mock broiled eels, p. 245). Maze-gohan or Gomoku-zushi (Five-color sushi rice with agé, p. 169). Suhuo-t’ui (Homemade Buddha’s ham). Tamago-toji

- yuba (Raw eggs cooked over hot yuba, p. 247). Tamago yuba (Deep-fried yuba in ankake sauce, p. 248). Kenchin-maki (Large yuba rolls with tofu and vegetables). Yuba shinjo (Yuba steamed with eggs, p. 249). Address: c/o Aoyagi, 278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan. Phone: (03) 925-4974.
654. Azumaya, Naoki. 1975. Nattô-kin ni yoru bitamin B-2 seisan ni kansuru kenkyû. I. Mg-2, Ni-2, Zn-2 no eikyô [Study on vitamin-B production by natto bacteria. III. The effect of magnesium, nickel, zinc, and lead positive divalent ions]. *Kumamoto Joshi Daigaku Gakujutsu Kiyô (J. of Kumamoto Women's University)* 27(1):81. [Jap]\*
655. Hayashi, Koreichi; Nagao, Kazumi. 1975. Nattô no eiyô-ka ni kansuru jikken-teki kenkyû. VI. Missen hozon de eiyô-ka no masu shuin ni tsuite [Experimental study on the nutritional value of natto. VI. The main factor in increasing the nutritional value during storage under tight sealing]. *Teikoku Gakuen Kiyô (Memoirs of the Teikoku Women's University)* 1:13-20. [Jap]\*
656. Hayashi, U.; Narasc, A.; Oura, Y. 1975. [Experimental study on the nutritional value of natto. V. Relationship between preservation of natto and its nutritive value]. *Teikoku Gakuen Kiyô (Memoirs of the Teikoku Women's University)* 1:7-12. (Chem. Abst. 85:45330d). [Jap]\*
657. Maki, Mitsufusa; Ishida, Tokuo. 1975. Nattô no nenshitsu-butsumu seisei ni kansuru jôken-teki kentô [Investigation of the conditions of viscous substance production in natto]. *Yonezawa Joshi Tandai Kiyô No. 10*. p. 51. [Jap]\*
658. Sundhagul, Malee; Daengsubha, W.; Suyanandana, P. 1975. Thailand's traditional fermented food products: A brief description. *Thai J. of Agricultural Science* 8:205-19. \*  
 • **Summary:** Originally: Staff of Microbiology Unit. 1975. Thailand's traditional fermented food products: description. Publ. of Thailand TISTR. 14 p. mimeo. ASRCT. Address: Thailand.
659. Taguchi, Kuniko; Kawabata, Noboru. 1975. Nattô no nenshitsu-butsumu ni kansuru kenkyû. II. [A study of the viscous substances in natto. II.]. *Kyoto Furitsu Daigaku Gakujutsu Hokoku B (Scientific Reports of the Kyoto Prefectural University, B)* No. 25. p. 7-12. [Jap]\*
660. Aoki, Hiroshi. 1975. Daizu no kenkô-hô [The way to health using soybeans]. Tokyo: Arrow Shuppansha. 206 p. [Jap]  
 Address: Japan.
661. Circle, S.J.; Smith, A.K. 1975. Soybeans: processing and products. In: N.W. Pirie, ed. 1975. *Food Protein Sources*. Cambridge, London, New York, Melbourne: Cambridge University Press. xx + 260 p. See p. 47-64. [88 ref]  
 • **Summary:** Contents: Introduction. Agronomy: Varieties, cultivation, yields. Soybean composition. Protein nutritional value. Traditional processing into nonfermented foods: Soybeans as a table vegetable (green soybeans), soy milk, tofu (soybean curd), yuba, kinako, salted soybeans, soybean sprouts. Traditional processing into fermented foods: Miso and shoyu, tempeh. Others include: natto, hamanatto, sufu (soy cheese), tao-tjo, kochu chang, ketjap, ontjom, and yogurt-like products.  
 Contemporary processing without defatting: 'Debittering' by aqueous treatment, whole bean processing, full-fat flour, soy milk and curd. Contemporary defatting processes: Defatting by aqueous processing, defatting with organic solvents, composite flour, soy flours, protein concentrates, protein isolates and textured soy products (recipes for using soy protein products in foods are available from several publications). Address: Anderson Clayton Foods, W.L. Clayton Research Center, 3333 Central Expressway, Richardson, Texas 75080.
662. Ohta, Teruo. 1975. Nattô kenkô-hô [The natto way to good health]. Tokyo: Futaba Books. 242 p. Illust. No index. 18 cm. [28 ref. Jap; eng+]  
 • **Summary:** This interesting, comprehensive book, by a scientist and expert on the subject, discusses all aspects of natto. Contents: Preface (p. 3). 1. History of natto and its mystery (p. 15). When did natto bacteria appear on earth? The mystery of ancient natto. The first meeting of ancient humans and sticky beans (*neba mame*). Natto is preserving food which was nurtured by the climate where people opposed the government. Why was the Japanese palate better? The amazing wisdom of the Japanese race—"Ancient fermented foods." *Tôshikyô* was a salty natto (*kata natto*) of 2,200 years ago. Natto originated during the Heian period [A.D. 794-1185]. Medicinal natto which Japanese monks kept secretly in olden times. The god of childbirth and princess natto (*hime natto*). Reasoning the "Natto Road." Village natto (*mura natto*) of Tanba, Yamaguni (p. 40). Shoyu-flavored natto started during the Muromachi period [1336-1573]. War provisions in field campaigns and natto. The military commanders of the Sengoku period also used Jinchô natto. Vendors calling out "Natto! Natto!" started during the Edo period (1600-1868). People who challenged the secrets of natto. The dark period of natto making. The mystery of the straw wrapper (*wara zuto*) and the Japanese people. The power of natto, which was studied by even the German army. The Japanese Army and navy studied the power of natto thoroughly (p. 60). Strong ally natto in the time of food shortage. The elite of the foods of the future. Mysterious medicinal effects of natto found in folklore.  
 2. The homeland of natto (p. 71). From *Hime natto*



to *Daraku nabe*—Fukushima prefecture. *Teramichi natto* of Yonezawa and Goto natto—Yamagata prefecture. The early, noncommercialized form of Yukiwari-natto was Goto natto, made with natto, koji, and salt, fermented together for 1 month. Since the middle of the Edo period (about 1735) it has been made in Yamagata prefecture, mostly in farmhouses. It is widely served over rice, mixed with a popular type of diced miso pickle. One commercial manufacturer is Maruyome Shokuhin in Yonezawa city, Yamagata prefecture. Yukiwari-natto looks like Finger Lickin' Miso. The legend of kuromame [black soybeans] of Kiyomasa-kô—Kumamoto prefecture. Pounded natto (*tataki natto*), “Ito” and “Oito”—Kyoto. Tôzô and ôzutsu natto—Chiba prefecture. Mito natto which was sold in train stations along the Jôbansen line—Ibaraki prefecture. Straw-wrapped natto (*warazuto natto*) and natto mochi of Omi—Shiga prefecture. Iwadeyama natto which was eaten by Hachiman Taro Yoshiie—Miyagi prefecture. Is hikiwari natto ancient natto?—Aomori prefecture. Fluffy natto (*fukkura natto*) in large cooked rice containers (*hettsumi*)—Saitama prefecture. Stood still at Kawanakajima saying “Nantoshô” (“What to do?”)—Nagano prefecture. Naisho mame in the pitch dark—Gunma prefecture. The origin of natto culture—Yokote’s hikiwari natto—Akita prefecture.

3. The secret of eating natto (p. 95). What are fermented foods. Super abilities of wonderful microorganisms. Comrades of microorganisms. Why cooked soybeans become natto. The natto bacterium is a magician. The useful component of amazing natto. Natto is the last natural food. Stamina food gives endurance to modern people. Natto protein is of high quality. Natto is an excellent maker of amino acids. Natto vitamins which are used by famous people to increase their stamina. The stickiness of natto is a bunch of active strong enzymes. The wondrous abilities of enzymes. Natto has a strong power to prevent sickness. If you take acidic food continuously, the body’s resistance will decrease. Natto is a wonderful alkaline food. There are many unsolved mysteries related to natto. To research the secret of very strong multiplication. The Japanese are an advanced country in terms of soybean utilization. It is important that a true health food should have good balance.

4. Medicinal effects of natto (p. 141). Common colds run away when they see natto. Dysentery and typhoid run away too. Skin disease such as favus and scabies—and natto. When the blood pressure rises, eat natto first. A feeling of faintness when you try to stand up is a sure sign of anemia. If you eat natto—no constipation problems. If you get fat during middle age, start a natto diet. The ideal food to prevent heart disease. Arteriosclerosis and natto. Natto strengthens the liver. The big news—natto bacteria control cancer. Natto keeps you from getting very drunk. Eating natto makes beautiful white skin. White rice and natto are ideal a mealtime. Natto—a strong ally of the stomach. Natto bacteria condition the intestines. Natto has the power to remove

radioactivity. Challenge the eternal youth and longevity with natto. Natto and mustard pack a double whammy.

5. How to make natto at home (p. 171). How to grow natto bacteria well. Steps in making natto. Various methods of incubation. The method of making natto at home. This is how natto was made in the old days. How to select good natto. How to measure the freshness of natto. The secret of small-bean natto. The difference between domestically grown and imported soybeans.

6. How to eat natto well (p. 199—with many natto recipes). Unique ways of eating natto over rice. Various natto soups. Deep fried natto dishes. Fun one-pot cookery. Snacks. Natto miso and dried natto. Famous preserved natto foods in the various provinces. Other uses and hints.

7. Chronology of natto from 10,000 B.C. to the present (p. 217-39). Key early dates include the following: Heian period: 1051—The legend of Minamoto (Hachimantaro) Yoshiie and natto began (Note: Minamoto Yoshiie was a famous Japanese warrior who lived 1039-1106). The Oshû Kaido [Oshu] became known as the natto road. 1062—Abe Sônin (or Abe Sadamune) started to make “Tôhoku Natto” (a type of sticky natto) in the Hida or Higo region of Kyushu, and was respected by the local people there. 1068—The word “natto” (*usu-shiokara natto*; lightly salted natto) first appeared in the *Shin Sarugakuki* by Fujiwara Akihira.

Kamakura period: Fermented black soybeans became very popular among the samurai and monks. 1129—Zen master Dogen of the Soto sect returned from Sung-dynasty China and introduced Buddhist Vegetarian Cookery (*shojin ryôri*) to Japan. 1211—Samurai (*bushi*) during the Kamakura period eat brown rice and fermented black soybeans (*shiokara natto*) for stamina. 1332—Soybeans were cultivated on a fairly large scale on land near Kamakura by the Tokugawa shogunate (*bakufu*). From these were made fermented black soybeans and other soyfoods which were quite widely used. 1334—During the Nanbokuchô period Kôgen Hôô appeared. In the Jôshôkôji in Tanba Yamaguni made Warazuto Natto and taught the process to the villagers. It was also called Yamaguni Natto, and remains there to this day.

Muromachi Period: The popularization of regular natto started as itohiki natto became “O-ito.” The *Teikun ôrai* contained recipes using fermented black soybeans (*shiokara nattô*). Fermented black soybeans were eaten by people as *tenshin* or *ochauke* with tea. Natto and tofu were widely served with Buddhist Vegetarian Cookery (*shojin ryôri*). Natto soup (*nattô-jiru*) originated. 1450—In the *Shôjin gyorui monogatari* [A comic tale of the great war between vegetarian foods and animal foods], natto appears as a person named Nattô Tarô Itogasane. 1532—The *Daiso ryôri-sho* (The Daiso cookbook) contains a detailed recipe for how to make natto soup (*nattô-jiru*).

Note: This is the earliest document seen (Jan. 2012) that mentions Yukiwari-natto (with or without a hyphen).

Continued. Address: National Food Research Inst., Tokyo, Japan.

663. Ohta, Teruo. 1975. [Science and technology of natto production]. In: Nattô Enkaku-shi (Natto History and Development). Tokyo: Sankei Press. 367 + 51 p. See p. 325-63. [Jap]\*

664. Ohta, Teruo. 1975. Nattô kenkô-hô [The natto way to good health (Continued–Document part II)]. Tokyo: Futaba Books. 242 p. [28 ref. Jap; eng+]

• **Summary:** Continued: Page 218: Doki natto is in an earthenware pot.

Page 220: Kusa-no-ki natto is fermented wrapped in tree leaves, which may also harbor natto bacteria. See illustration.

Page 222: Picture of Tohoku natto.

Page 223: Yamaguni natto and Sandara-bochi natto. Still made in Niigata for use mainly as a gift.

Page 224: Ito, Oito, Natto Taro.

Page 226-27: Hamana natto, Goto natto, Mushiro natto, kombu natto is a type of tera natto [fermented black soybeans]. Hachi natto: Incubate topped with straw in a suribachi.

Page 228: Momen natto and zaru natto. An illustration shows that a zaru is quite deep.

Page 230: Hishi natto: Made in the middle of winter. Miso natto, shiru natto, kibako natto, jubako natto, oke natto, hachi natto. Illustration with 1 sho measure of beans.

Page 232: Tofuya natto, kaki natto, warazuto natto = tsuto natto = tsutoiri natto.

Page 233: In illustration shows tataki natto, itohiki natto.

Page 234: Korumame, ogi natto (fan shaped), Hanzawa-shiki natto yoki, kyogi natto.

Page 236: Take no kawa natto, kyogi natto (kyo is the warp in weaving), poly natto, sudare natto.

Page 238: Roketto natto, jinko kyogi natto, kappu (cup) natto, PSP (polystyrene paper) yoki, tomobuta PSP natto.

Page 240: Aluminum yoki, monaka natto (like Tai-yaki, eat the whole thing). Note 1. The preceding pages would enable one to write an illustrated history of natto containers. This is the earliest document seen (Jan. 2012) that mentions PSP (polystyrene paper) containers used to package natto.

Note 2. There are many good cartoons about natto in this book. Address: National Food Research Inst., Tokyo, Japan.

665. Tenne, F.D.; Mengistu, A.; Sinclair, J.B. 1975. Occurrence and identification of *Bacillus subtilis* associated with soybean seeds from six geographical countries. *Proceedings of the American Phytopathological Society* 2:91 (Abst. NC-45).

• **Summary:** The six countries are China, Ethiopia, Pakistan, Puerto Rico, Thailand, and USA. *Bacillus subtilis* appears to be an omnipresent seed-borne bacterium on soybeans; it can cause seed decay under conditions of high moisture

and temperature. Address: All: Univ. of Illinois, Urbana, IL 61801.

666. Wolf, W.J.; Cowan, J.C. 1975. Soybeans as a food source. Revised ed. Cleveland, Ohio: CRC Press. 101 p. Illust. Index. 26 cm. CRC Monotopic Series. [416 ref]  
• **Summary:** Contents: Introduction. Seed structure and composition. Soybean production: Early history, areas of production, production, importance of varieties. Disposal of the crop: Grading standards, disposition. Processing soybeans into oil and meal: Storage, preparation of beans, extraction, desolventizing, degummed oil and lecithin separation. Conversion to edible oil products: Alkali refining, bleaching, hydrogenation, deodorization. Soybean oil products: Salad and cooking oils, shortening and margarine oils, flavor stability of soybean oil, soybean lecithin–products and use. Food uses of soybean proteins: Physical and chemical properties (solubility as function of pH, molecular size, reactions of the 7S and 11S globulins, solubility of isolates, denaturation, amino acid composition), forms of soy proteins (whole soybeans, processed soybean protein products), selling prices and production estimates, functional properties (emulsification, fat absorption, water absorption, texture, dough formation, adhesion, cohesion, and elasticity, film formation, color control, aeration), nutritional properties (antinutritional properties, protein quality of soybean products), foods containing soy proteins (Oriental foods [tofu, kori-tofu, miso, natto, shoyu, tempeh], domestic foods [baked goods, meat products, simulated meats, breakfast cereals, infant foods, beverages, dietary foods, snack foods, miscellaneous uses]), problem areas. Conclusions.

Addendum. Introduction: Origin of soybeans, soybean situation–future, recent sources of information, soybean organizations. Production: Short-term situation, storage and exports, soybean varieties, yield barrier, varieties and antinutritional factors, aflatoxin in soybeans. Edible oil products: Deodorization, an antioxidant for soybean oil, flavor stability of soybean oil, oil from field-damaged beans, flavor components in soybean oil. Conversion to edible protein products: Production and producers, new processes (full-fat products, defatted flakes and related products, concentrates, isolates, textured protein products). Properties of soy proteins: Functional properties (solubility, water absorption and swelling, viscosity, emulsification, film formation, texture), nutritional and physiological properties (trypsin inhibitors, soybean proteins in blended foods, nutritional value of textured soybean proteins, soybean proteins in infant formulas, effect of alkali treatment on soy protein), flavor studies on soy proteins (organoleptic evaluation of commercial protein products, origin of flavor compounds). Food uses of soybean proteins: Baked goods, meat products and analogs, instant breakfast items, snack foods, legal and regulatory aspects. References.

An excellent source of information on soy flour

and modern soy protein products, this book contains a surprisingly small amount of information (about 1 page total) about traditional soyfoods such as tofu, miso, natto, shoyu, tempeh, etc. even though a number of the latter foods are much more widely used worldwide. Soy beverage (soymilk) is not even mentioned. The extensive bibliography would be greatly improved by the inclusion of the titles of the articles.

Table 26, titled “Selling prices and production estimates (in 1970) for soybean proteins” (p. 42) states: Defatted flour and grits sell for 7-8 cents/lb ex factory and estimated annual production in 1970 was 232-237 million lb. Soy concentrates (18-26 cents/pound, 20-35 million lb). Soy isolates (35-45 cents/pound, 25-50 million lb). Address: 1. Research Leader, Meal Products, Oilseed Crops Lab., USDA NRRL, Peoria, Illinois; 2. Adjunct Prof. of Chemistry, Bradley Univ., Peoria, Illinois 61606 (Formerly Chief, Oilseed Crops Lab., NRRL, Peoria).

667. Zenkoku Natto Kyodo Kumiai Rengokai (Japanese National Natto Assoc.). ed. 1975. Nattô enkaku-shi [Natto history and development]. Tokyo: Zenkoku Natto Kyodo Kumiai Rengokai. 367 + 51 p. Illust. No index. 21 cm. [208 ref. Jap]

• **Summary:** Name of organization with diacritics is: *Zenkoku Nattô Kyôdô Kumiai Rengokai*. The name of this trade association has also been translated as “Japanese United Society of Natto Makers.”

Contents: Natto (p. 15). Memories of natto and the school lunch program (p. 16). Record of going towards prosperity (p. 17). At the publication of Natto Enkaku-shi (p. 18).

Yayoi period to 21st Century (p. 19). Origin of natto and also new and old natto (p. 23). Natto chronology and general history of Japan (p. 63): (1) History of cultural aspects of natto (p. 63). (2) Zenkoku Natto Kyôdô Kumiai Rengokai (Zennoren; Japanese National Natto Association) chronology (1939-1974) (p. 85).

History of the Japanese National Natto Association (p. 109). People who contributed towards the development of natto (p. 154): Jun HANZAWA (p. 158). Jirô MIURA (p. 165).

Topography of natto (Natto in the provinces, p. 171). Appendix. Topography of natto in illustrated map (p. 172).

Methods of making the various types of provincial natto (illustrated) (p. 199): (1) How to make straw wrap Containers (p. 200). (2) Hinoyama (or Hiyama? or Hinoki Yama?) natto = Cedar mountain natto (p. 201). (3) Iwamuro (rock room) natto (p. 202). (4) Kama (cauldron) natto (p. 203). (5) Tsuchi (earth/soil/dirt) natto (p. 204). (6) Kotatsu (charcoal body warmer) natto (p. 205). (7) Taru (vat) natto (p. 206). (8) Yuki (snow) natto (p. 207). (9) Oke (tub) natto (p. 208). (10) Yutanpo (hot water bottle) natto (p. 209). (11) Bara (loose) natto (p. 210). (12) Hoshikusa (hay) natto (p. 211). (13) Yamaguni (mountain country) natto (*hōsei natto*)

(p. 212). (14) Hettsui (wooden container for cooked rice) natto (p. 213). (15) Hikiwari (ground and cracked) natto (p. 214). (16) Taihi netsu riyô (making natto using heat from compost) natto (p. 215). (17) Sumigama (kama-oven for making charcoal) natto (p. 216). (18) Usu (mortar) natto (p. 217). (19) Momen (cotton) Natto (p. 218). (20) Sakadaru (upside-down vat) natto (p. 219). (21) Tsurushi (hanging) natto (p. 220). Illustration of natto containers and equipment (p. 222).

Appendix. Medicinal effects (properties) and nutritional properties of natto (illustration) (p. 242).

Healthy eating with natto (p. 243). Natto contains enzymes for an activate life (p. 245). Natto protein in the secret to good health (p. 250). Boosting your energy with vitamin B-2 from natto (p. 255). The mysterious power of natto (p. 258). Japanese stomach cancer and natto (p. 264).

Mini natto dictionary (*mame jiten*) (p. 281).

Natto cookery: 100 selected recipes (p. 295).

Future prospects of the natto industry (p. 322). The importance of natto production technology (p. 325).

Directory of Japanese National Natto Association (*Zenkoku Natto Kyôdô Kumiai Rengokai*) members.

Advertisements of related companies. Address: Tokyo, Japan.

668. Ho, Coy Choke; Koh, Chong Lek. 1976. Microbiology of soybean-based fermented food in South-East Asia. Paper presented at the Third INTSOY Regional Soybean Conference. 7 p. Held 23-27 Feb. 1976 at Chiang Mai, Thailand. Unpublished manuscript. [17 ref]

• **Summary:** The relatively well-studied soy-based fermented foods in South-east Asia are tempe, sufu (soy cheese), ontjom tahu [okara tempeh], tau chiow ([tauco, taucho], soybean paste), soy sauce, and thua-nao (natto). These are shown in Table 1, with the microorganisms responsible for fermentation, substrates, uses, and principal references given for each. “It can be noted that only a very limited range of genera of fungi are involved in these fermentations, namely *Rhizopus*, *Aspergillus*, *Neurospora*, *Actinomucor* and *Saccharomyces*. Furthermore, within a genus only a very limited number of species are actually utilized, for example *Aspergillus sojae* in soy sauce fermentation, and *Neurospora intermedia* in ontjom tahu fermentation.

“Regarding ontjom tahu fermentation, the fungus used was formerly erroneously listed as *Neurospora sitophila* (Dwidjoseputro, 1961).”

The authors then use analyses of conidia color and crossing experiments based on meiotic sterility to show that the cultures on okara tempeh (ontjom tahu) belong to a single species, *Neurospora intermedia*.

Note: This is the earliest English-language document seen (March 2009) that uses the word “tau chiow” to refer to Indonesian-style miso. Address: Dep. of Genetics and Cellular Biology, Univ. of Malaya, Kuala Lumpur, Malaysia.

669. Kozaki, Michio. 1976. Fermented foods and related microorganisms in Southeast Asia. *Proceedings of the Japanese Association of Mycotoxicology* No. 2. p. 1-9. March 20. [16 ref]

• **Summary:** Table 1, “Main fermented foods using molds, yeasts or bacteria in Southeast Asia,” contains four columns: Name of fermented food, raw materials, main related microorganisms, and remarks (incl. names in other countries). Fermented foods listed include amazake (tapé / tapeh in Indonesia, with *Rhizopus* instead of *Aspergillus oryzae*), tempeh, sufu, ontjom, natto (soy bean fermented with *Bacillus subtilis* var. *natto*; Teranatto [fermented black soybeans] is same as original miso, Taosi in Philippines).

Table 2, “Main fermented foods using molds plus bacteria, molds plus yeasts, yeasts plus bacteria and molds, or yeasts plus bacteria in Southeast Asia,” contains the same four columns. Fermented foods listed include soy sauce (*Aspergillus oryzae*, *Saccharomyces rouxii*, *Pediococcus halophilus*; called Jan [kanjang] in Korea and Thua nao [sic] in Thailand), Miso (same 3 microorganisms as in soy sauce). Address: Tokyo Univ. of Agriculture, Dep. of Agricultural Chemistry, 1-1, Suragaoka, Setagaya-ku, Tokyo.

670. Ito, Hiroshi. 1976. Hamanattô [Hamanatto]. *Nippon Jozo Kyokai Zasshi (J. of the Society of Brewing, Japan)* 71(3):173-76. March. [Jap; eng+]

• **Summary:** Contents: Introduction. A brief history of Hamanatto. Methods of production: Yamaya and Horinji methods, Daifukuji method. The microbiology and chemistry of Hamanatto fermentation. Hamanatto’s special characteristics. Serving Hamanatto. Conclusion. Acknowledgments.

Two flowcharts show Hamanatto production methods at Horinji and Daifukuji. Tables: 1. Distribution of various microorganisms in Hamanatto (cells per gram) at Yamaya, Horinji, Daifukuji. 2. Nutritional composition of Hamanatto (from Yamaya, Horinji, and Hamana), Daitokuji natto, and regular sticky natto. 3. Composition of free amino acids (mg per 100 gm defatted, and gm per 10 gm protein) in Yamaya Hamanatto, Daitokuji natto, Yamaya Hamanatto, soybean miso (temperature controlled- and natural fermentations), and Hatcho miso. 4. Composition of Hamanatto fats. 5. Volatile acids in Hamanatto. 6. Aromatic compounds in Hamanatto.

In Japan, there are basically two types of natto: Regular natto (*itohiki-natto*) and salty natto (*shiokara-natto*). Generally the word ‘natto’ refers to the former but in Shizuoka prefecture in and around Hamamatsu city a type of salty natto called *hamanatto* is famous. Totally unrelated to regular natto except in name and the fact that both are fermented soyfoods, it is actually a close relative of soybean miso in terms of its flavor and the way it is produced. However unlike miso, the soybeans retain their original

form, uncrushed, and the product has its own unique flavor and aroma. Another type of salty natto is Kyoto’s Daitokuji-natto.

A brief history of hamanatto: Hamanatto originated in ancient China and is one of the progenitors of today’s miso and shoyu. Many old documents show that its relatives *kokusho* (‘grain chiang’) and *teranatto* (‘temple natto’) were brought to Japan from ancient China. A type of fermented, salt-preserved cooked soybeans called *tou-ch’ih kyo* was excavated together with articles buried with one *Mao-tai*, a ruler of the early Han dynasty who lived about 2200 years ago. This was the earliest form of hamanatto. According to the first scholars and envoys from Japan to T’ang dynasty China, *chiang* and *kuki*, both progenitors of miso and shoyu, were introduced to Japan from China. Records show that the great T’ang dynasty Buddhist master Ganjin, who came to Japan by boat in 753, brought with him 1428 gallons of ‘sweet kuki,’ an early type of salty natto. The first mention of salty natto in Japan appears in Fujiwara Akihara’s *Shinsaru Gakki / Shin Sarugakuki*, written in 1286 [Note: Others give the date as 1068]. The first character of the word ‘natto’ means ‘to pay, supply, or dedicate;’ the second means ‘bean or soybean.’ According to the *Honcho Shokkan*, written in 1697, the first character was derived from the fact that natto were first prepared in Japanese temple kitchens which are known as *na-ssho*, the place which supplied the monk’s food. Since the propagation of salty natto throughout Japan was done primarily by temples, they also came to be known as ‘temple natto’ (*tera-natto*). They served as an important source of protein and savory seasoning in the Buddhist vegetarian diet. Kyoto’s Daitokuji-natto, Ichimei Ikkyuji-natto, and Tenryuji-natto, each made in temples, and the Hamanatto made at Daifukuji and Horinji temples in and around Hamamatsu city are popular to this day. Hamanatto first became known when the monks of Daifukuji temple presented some to the seventh Ashikaga shogun, Ashikaga Yoshikatsuko, during the 1400s. during the Warring States Period (1467 to 1568) they also presented Hamanatto to lords of the families of Imagawa Toyotomi, and Tokugawa.

Note: This is the earliest document seen (Nov. 2011) that mentions “Ikkyuji” or “Ichimei Ikkyuji” in conjunction with Daitokuji natto.

Because of its unique flavor and aroma and good keeping qualities, hamanatto became known throughout Japan. In some cases the skin of sansho seeds (Japanese pepper; *Zanthoxylum piperitum*) were mixed in and the product called *kara-natto* (‘spicy natto’). When Toyotomi Hideyoshi undertook his Korean campaigns, he took lots of hamanatto with him. When he arrived in the ancient province of Hizen in northwest Kyushu, just before his soldiers embarked in boats to Korea, he gave this food the same name, *kara-natto*, but written with characters which mean ‘beans for subjugating T’ang dynasty Korea.’ This name, he hoped, would bring him luck in his campaign. After

returning to the Hamamatsu area in central Japan, he donated land to makers of hamanatto to encourage their craft.

Later, when Tokugawa Ieyasu took over Hamamatsu castle, he used hamanatto as soldiers' provisions. Each year the local monks gave hamanatto as a gift to the shogun, who in turn used it as a New Year's offering. Still later, produced by temple cooks and craftsmen, it was given as a New Year's gift to parishioners; it also had a symbolic meaning since the word for soybeans (*mamé*) has also come to mean healthy and robust. In 1968 Yamaya, a producer of tamari shoyu (soy sauce) under the direction of Suzuki Yasuke, attempted to make an improved version of the product previously prepared at Daifukuji temple and first affixed the name 'hamanatto.' Thus the name of the product developed in the following order: *shiokara-natto* ('salty natto), *kara-natto* (T'ang dynasty natto), *hamana-natto*, and *hama-natto*. To this day, Daifukuji has maintained its own special method of production, but this too has been commercialized.

Methods of production: Today hamanatto is prepared by two methods: the traditional method handed down from generation to generation since ancient times, and the modern industrialized method which made improvements on the traditional method without harming the special flavor and aroma. Yamaya company and Horinji temple use closely related methods; the former is industrialized while the latter is a handmade process using koji starter. Daifukuji uses a different traditional process without koji starter since the ancient incubation room, wooden trays, and rice-straw covering mats are each permeated with starter mold spores. The soybean koji (molded soybeans) is combined with brine and put into vats for the second fermentation in September. Since the room temperature during the koji making (first fermentation) is 20° to 25°C (68-77°F) no special incubation heat source is needed. Yet since the molds propagate naturally, without special inoculation, the koji making takes a long time, up to ten days.

There are numerous points of difference from regular miso production; when making salty natto [fermented black soybeans] the soybeans are not crushed; the koji is incubated with brine in a keg or vat with a heavy pressing lid; and the final product is sun-dried. At the factory, the soybeans are only partially reconstituted [by soaking in water] until they reach 1.5 to 1.6 times their dry weight; this takes 2 hours in winter and 1½ hours in summer. They are then drained and allowed to stand for 4-5 hours so the absorbed water penetrates deeper. If they are drained for too long, the beans become hard. They are then steamed for 4-5 hours [at atmospheric pressure] and allowed to stand overnight in the steamer. At Daifukuji, the unsoaked beans are dropped into boiling water, parboiled for 7-8 minutes, steamed for 7-8 hours in a 2 meter deep steamer, then allowed to stand in the steamer until the next morning. Care is taken that the beans are not crushed or dehulled. Nowadays, since it is known that the process of leaving the beans overnight in

the steamer lowers their net protein utilization and makes them more difficult for the enzymes to digest, this step is generally omitted. Traditionally it was always used to darken the beans; there were apparently no problems with bacterial contamination, perhaps because the reaction of sugars and amino acids under heat produces substances which reduce the proliferation of bacteria and yeasts. In fact, the overnight period in the steamer may have been done expressly to encourage this effect. Continued.

671. Ito, Hiroshi. 1976. Hamanattô [Hamanatto (Continued—Document Part II)]. *Nippon Jozo Kyokai Zasshi (J. of the Society of Brewing, Japan)* 71(3):173-76. March. [Jap; eng+] • **Summary:** Continued. The steamed beans are then spread on a thick rice straw mat (*mushiro*), drained well, sun dried, sprinkled with roasted barley flour, and mixed until each bean is well coated. The straw mat helps to absorb excess water. In factories, the roasted flour is premixed with koji starter (*Aspergillus oryzae* mold spores), they dried the straw mat and used it year after year. Molds such as *A. oryzae*, *A. soyae*, and *Rhizopus* species inoculated the beans during mixing with the flour. The mixture is covered for one night with rice straw mats, then the next day transferred to wooden koji trays, which are arranged in the koji incubation room to make koji. Care must be taken that excess heat does not develop during fermentation, lest alien bacteria proliferate and the product's flavor and aroma decline. To prevent this, the koji mycelium is broken up three times by hand in the trays during the incubation.

At factories, the finished koji is sun-dried for 4 to 5 hours in winter (Hamamatsu is famous for its dry fall winds) or for 2 hours in summer so that the moisture content is reduced to below 30 to 35 percent. IF this drying is insufficient, after the beans have been put into the vats they easily get crushed. The vat used is a 19-gallon wooden vat or a small wooden tub. The koji is divided among several vats, brine made by combining salt with boiled water is added, a pressing lid equal to twice the weight of the vat contents is set in place, and the mixture is allowed to ferment for 80 to 90 days in summer or 150 days in winter. (In some places (Daifukuji), unpasteurized shoyu is used in place of brine).

The use of a heavy pressing lid is preferable since it causes the fermentation to proceed slowly; a light one helps it to go faster, but the soybeans more easily lose their form. At temples they sliver the middle skin of sansho seeds and place these at the bottom of the vat, then add the finished koji and finally the brine. In factories they add a more concentrated brine and ferment the mixture for at least 2 months. The fermentation room (*kura*) should have good air circulation and ventilation, otherwise the product may develop and unpleasant moldy or musty odor.

After draining off the brine scooping the beans out of the vats, they are spread on rice straw mats (traditionally *mushiro* from the Ryukyu islands; today *tatami* matting),

sun-dried, and sifted to remove small pieces, which are discarded. In a separate process, gingerroot is cut thinly, soaked in boiling water, sun dried, and soaked in moromi (shoyu mash) for about 10 days to make pickled gingerroot. Sansho seeds are also added to some types.

The microbiology and chemistry of Hamanatto fermentation: The molds found in fresh hamanatto koji and commercial hamanatto, in addition to *Aspergillus oryzae*, include *Rhizopus* species and *A. niger*. Hamanatto such as that made at Daifukuji using a low incubation temperature (20-25°C) and a long time contains a large proportion of *Rhizopus* on the surface of the soybeans. Moreover the amylase and protease enzymes in these molds are weaker and less active than those from the koji used for commercial shoyu or miso. For this reason the soybeans are not broken down, but rather remain in their whole form. If the koji is made mechanically, the enzyme strength and quality increases. The incubation proceeds more quickly in summer since the temperature is higher; the koji is ready in 3 days.

In general during the koji production, amylase, protease, and pepsidase activity reach a maximum at 50 hours, but in order to dry it, it must be left longer which causes the activity to decrease. In addition to molds, lactic acid bacteria and film yeasts, which are related to *Pediococcus*, are found in all hamanatto; they are mixed in during contact with the straw mats. If air circulation during koji production is poor, lactic acid bacteria proliferate more than usual. Unlike most lactic acid bacteria, they ferment soybean sugars creating undesirable effects, but do not ferment lactose. After the koji-brine mixture is in the vats, film yeasts proliferate among the various flavors; at 45 days they are most abundant, then later decrease. Especially on the surface of vats with poor air circulation, they are found as a white mold. These yeasts produce hamanatto's unique aroma.

Hamanatto's special characteristics: Because the fermentation time is long, the color turns a dark brown. The form of the beans is well preserved. The composition of nutrients is shown in figure 2. Compared with regular natto, hamanatto has less moisture and more salt. Free amino acids are shown in figure 3. Those abundant are glutamic acid, leucine, and proline, while cystine, tryptophan and methionine are the most scarce. Compared with soybean miso, arginine, cystine, and histidine are also relatively scarce. Since soybean miso undergoes an even longer fermentation than hamanatto the difference is the amino acids freed from the soybeans, which is particularly enhanced by protease enzymes from the koji molds. Hamanatto flavor is rich and full-bodied, somewhat like that of soybean miso, but with a special aroma, more tartness, and a unique flavor component that Japanese call *egumi*. The latter, related to oil rancidification, imparts what some describe as a subtle harsh or unpleasant stimulation to the tongue or throat. Kiuchi et al, in 1976, in an analysis of hamanatto lipids, found that this *egumi* originates from

linoleic acid. Hamanatto fats, unlike those of regular natto, are more than 70 percent of free fatty acids. The majority of fats in both natto and soybeans are triglycerides, with other fat components being relatively low. The lipase in hamanatto koji breaks down a large percentage of the fats but the composition of the resulting fatty acids is not different from those found in soybeans; in both cases, linoleic acid comprises more than 50 percent of the total.

Hamanatto's volatile acids and aromatic compounds are shown in figures 5 and 6. The aroma of Yamaya's hamanatto was superior to that of Daifukuji or Hamana. This aroma was very poor just after the koji was made but during the ripening of various flavors, isobutyl aldehyde, isobutyl alcohol, and various amines decrease together with a decrease in the poor aroma. However if the air circulation is bad while making koji or during the vat fermentation, alien microorganisms proliferate, leaving an undesirable aroma.

672. Ito, Hiroshi. 1976. Hamanattô [Hamanatto (Continued—Document Part III. Continued)]. *Nippon Jozo Kyokai Zasshi (J. of the Society of Brewing, Japan)* 71(3):173-76. March. [Jap; eng+]

• **Summary:** Continued. Serving Hamanatto: Hamanatto is used both as a seasoning and as a protein source. Like Daitokuji-natto it is sprinkled as a seasoning over hot rice in a small bowl, then doused with hot green tea to make the popular Ochazuke. It may also be served as an hors d'oeuvre with sake, used in place of tea cakes with whisked green tea as Chauke, or served as a rice seasoning in box lunches like shoyu-simmered kombu. Since ancient times it has been used in Zen Temple Cookery as a source of subtle flavor, diced and mixed with grated daikon, sprinkled with vinegar, or used in the Chinese tofu dish Mabo-dofu. Its abundance of glutamic acid and nucleic acids enrich the flavor of any food with which it is served.

Conclusion: Hamanatto, a progenitor of today's miso and shoyu, has been made by traditional methods since ancient times. Long lasting, it embodies the fermentation and nutritional wisdom of our forebears. Thus its scientific study reveals new and valuable information. In its traditional processing there are points that should be improved, yet today it is a long lasting food with its own distinctive characteristics.

Acknowledgements: I would like to thank the Yamaya and Hamana companies for supplying documents and samples, and allowing me to quote selected portions; Professor Kayo Kon of Shizuoka Women's University; and my colleagues at the National Food Research Institute, Kan Kikuchi, Teruo Ota, and Shinkuni Sasachi.

Figures show: (1) Hamanatto production methods: Flow charts of the Yamaya-Horinji method (Horinji is in parentheses), and of the Daifukuji method.

Tables show: (1) Distribution of microorganisms in Hamanatto made by Yamaya, Horinji, and Daifukuji. For

each maker, there is one column for surface and another for interior. The types of microorganisms are: General bacteria, micrococcus, streptococcus, pediococcus, halophilic lactic acid bacteria, firm-forming yeasts, and molds (Mostly *Aspergillus oryzae* and *Rhizopus* species).

(2) Nutritional composition of three varieties of Hamanatto (Yamaya, Horinji, Hamana), Daitokuji natto, and regular “stringy” (*itohiki*) natto.

(3) Composition of free amino acids in various fermented foods: (A) Yamaya Hamanatto, Daitokuji Natto (both in mg per 100 gm defatted); (B) Yamaya Hamanatto, Daitokuji Natto, Soybean miso (made at controlled temperature), Soybean miso fermented at natural ambient temperature (all four in gm per 100 gm of protein); (C) Hacho miso (in mg per gm). In the far left column 18 amino acids are listed.

(4) Composition of Hamanatto lipids. The four vertical columns are: TG = Triglycerides. DG = Diglycerides. ST = Cholesterol. FFA = Free fatty acids, MG = Monoglycerides. The four horizontal rows are: Soybeans, dry. Soybeans, steamed. Natto. Hamanatto.

(5) Hamanatto volatile acids. (6) Hamanatto aromatic compounds.

673. Norinsho. 1976. *Nihon shokuhin hyôjun seibunhyô* [Food composition tables for Japan. 2nd ed]. Tokyo: Ishiyaku Shuppan K.K. 180 p. March 25. Index. 15 x 21 cm. [Jap] • **Summary:** The first edition of this book was published on 15 Jan. 1964. The first revised edition (130th printing) was published on 25 Jan. 1969. This is the second revised edition (265th printing), published on 25 March 1976. Also published by Joshi Eiyo Daigaku Shuppan-bu.

For soybeans and soyfoods, see pages 33-35, 69, and 74 (basic nutritional composition), and 111-12 (amino acid composition).

Page 88, No. 812: Amazake. Per 100 gm. Calories 101, moisture 74.0 gm, protein 2.4 gm, fat 0.1 gm, carbohydrates (sugars 22.7 gm, fiber 0.6 gm), ash 0.2 gm, calcium 74 mg, phosphorus 25 mg, iron 0.4 mg, vitamin A 0 mg, vitamin B-1 0.08 mg, vitamin B-2 0.06 mg, nicotinic acid 0.06 mg, vitamin C 0 mg.

A later edition (after 1976), containing at least 298 pages, gives details on the following soy-related foods (p. 76-80): Japanese-grown whole soybeans (dry, or boiled). Whole dry USA-grown soybeans. Whole dry Chinese-grown soybeans. Green immature soybeans (edamame; raw, or boiled). Soybean sprouts (raw, or boiled). Defatted soybeans (whole, or dehulled). Kinako (soybeans roasted and ground). Budô-mame (soybeans boiled with shoyu). Momen tofu (regular). Kinugoshi tofu (silken). Soft tofu. Packed tofu. Okinawa tofu. Yaki-tofu (grilled). Nama-age. Abura-age. Ganmodoki. Kôri-dofu. Tofu-chikuwa (steamed type, or roasted type). Natto (fermented soybeans): Itohiki-natto, Goto natto, or tera-natto.

Miso: Rice-koji miso (sweet type, light yellow type, dark yellow type). Barley-koji miso. Soybean-koji miso. Dried miso. Kinzanji miso. Hishio-miso.

Other: Okara. Soymilk (regular, reconstituted, or soft drinks). Yuba (wet, or dried).

Page 254 gives the amino acid composition of soybeans and various soyfoods. Page 298 gives the protein scores, amino acid values, and chemical scores of selected foods. Page 8 gives the energy conversion factor for tofu, age, and yuba.

674. Wallace, Richard. 1976. Re: Interest in making natto. Letter to William Shurtleff at New-Age Foods Study Center (278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan), April 23. 1 p. Handwritten.

• **Summary:** “I am a beginner and would like to know how to obtain the bacteria ‘Bacillus Natto’ used in making natto. I would appreciate hearing from you. Thank you. Sincerely yours...”

Note: This is the earliest dated document seen in which “New Age Foods Study Center” (the predecessor of Soyfoods Center) is mentioned. Address: 2357 Reed Way, Hayward, California 94541.

675. Kiuchi, Kan; Ohta, T.; Itoh, H.; Takabayashi, T.; Ebine, H. 1976. Studies on lipids of natto. *J. of Agricultural and Food Chemistry* 24(2):404-07. March/April. [16 ref. Eng]

• **Summary:** The lipid contents and compositions of three products were measured: Itohiki natto (2.8% lipids), Yukiwari natto (10.9%), and Hama-natto (6.4%). Yukiwari natto is made by mixing Itohiki natto with rice koji and salt, then aging the mixture at 25-30°C for 15 days.

The gas chromatographic pattern of fatty acid composition of Hama-natto is similar to that of soybeans, however 78% of the total lipids in hamanatto is free fatty acids.

Note 1. This is the earliest English-language document seen (Jan. 2012) that mentions “Itohiki natto.”

Note 2. This is the earliest English-language document seen (Dec. 2011) that mentions “Yukiwari natto.” Address: Div. of Applied Microbiology, National Food Research Inst., Tokyo.

676. Iso, Naomichi; Mizuno, H.; Saito, T.; Takeuchi, H.; Suyama, Y.; Kawamura, S.; Ogawa, H. 1976. The viscometric behavior of a natto mucin in solution. *Agricultural and Biological Chemistry* 40(9):1871-75. Sept. [20 ref]

• **Summary:** The natto bacterium, *Bacillus subtilis* produces polyglutamic acid (PGA) and mucin; the latter substance is considered to be similar to PGA. This study found that the structure / conformation of the mucin molecule and the way it flows depend on the pH of mucin solution used. The molecule is randomly coiled at pH 5.7 but changes to

a rod-like molecule at pH 4.3. A 2% solution behaves as a thixotropic flow at pH 5.7 but as a Newtonian flow at pH 4.3.

Photos (taken with an electron microscope) show: (1) Electron micrograph of a natto mucin at Ph 6.5. (2) Electron micrograph of a natto mucin at Ph 2.5.

Also contains four graphs. Address: Dep. of Food Science and Technology, Tokyo Univ. of Fisheries, Konan, Minato-ku, Tokyo, Japan.

677. Shurtleff, William; Aoyagi, Akiko. 1976. *The book of miso*. Hayama-shi, Kanagawa-ken, Japan, Soquel, California, and Brookline, Massachusetts: Autumn Press. 256 p. Sept. Illust. by Akiko Aoyagi. Index. 28 cm. Revised ed. 1981. New York, NY: Ballantine Books, 620 p. [60 ref]

• **Summary:** Contents: What is miso? Preface. Acknowledgments. Part I. Miso: Savory, High Protein Seasoning. 1. Soybeans, protein and the world food crisis. 2. Miso as a food. 3. The miracle of fermentation. 4. The varieties of miso: Introduction. An overview: Natural vs. quick miso, salty vs. sweet miso, red vs. white miso, chunky miso and koji miso vs. smooth miso, expensive vs. inexpensive miso, miso from the provinces.

Regular Miso: Rice miso (red / aka, light-yellow / shinshu, mellow red / amakuchi akamiso, mellow beige / amakuchi tanshoku, mellow white / shiro koji, sweet red / edo or edo ama-miso, sweet white / Kyoto shiro miso), barley miso (karakuchi mugi, mellow barley / amakuchi mugi), soybean miso / mamé miso (miso-dama, Hatcho miso, soybean miso / mame miso, tamari miso). Special Miso: Finger lickin' miso / Namemiso (Kinzanji miso, moromi miso, hishio, namémiso, natto miso, goto miso), sweet simmered miso / nerimiso. Modern Miso: Akadashi miso, dehydrated or freeze-dried miso, low-salt / high-protein miso.

Part II. Cooking with Miso (400 recipes). 5. Getting started. 6. Recipes from East and West: Miso toppings, miso in dips & hors d'oeuvres, miso in spreads & sandwiches, miso dressings with salads, miso in soups & stews, miso in sauces, miso with grains, beans & tofu, miso in baked dishes, miso sautéed & simmered with vegetables, miso in grilled dishes, miso in deep-fried dishes, miso & eggs, miso in desserts, miso pickles, koji cookery.

Part III. The Preparation of Miso. 7. Making miso at home and in communities. 8. Japanese farmhouse miso (incl. miso-dama). 9. The traditional miso shop. 10. The modern miso factory. Appendixes: A. A brief history of chiang, miso, and shoyu: Introduction, Chinese chiang, early Japan, the Nara Period (710 A.D. to 784 A.D.), the Heian Period (794 A.D. to 1160 A.D.), the Kamakura Period (1185 A.D. to 1333 A.D.), the Muromachi Period (1336 A.D. to 1568 A.D.), tamari—the forerunner of shoyu (Priest Kakushin returns to Japan from China, where he learned how to make Kinzanji miso, settles at Kokoku-ji temple near town of Yuasa, discovers tamari), miso during the Edo Period (1603

A.D. to 1867 A.D.), the development of shoyu the Meiji and Pre-war Periods (1867 A.D. to 1941 A.D.), modern times, transmission to the West.

B. The varieties of Chinese chiang, Korean jang and Indonesian Tao-tjo. C. The chemistry and microbiology of miso fermentation: Introduction, koji starter molds, making koji starter, making koji—the first fermentation, cooking the soybeans, preparing the miso—the second fermentation, the finished miso. D. People and institutions connected with miso: In Japan—Miso research scholars and institutes, exporters of natural miso and koji to the West, traditional or semi-traditional shops making natural miso, Japan's ten largest miso factories (gives the production in tons/year for several companies), other well-known miso makers. Makers of koji starter and koji, Japanese restaurants specializing in miso cuisine. North America—Miso research scholars and institutes, commercial miso makers, companies importing Japanese miso, koji, or koji starter, individuals interested in miso. Europe (Belgium, England, France, Germany, Holland, Italy, Portugal) and Latin America (Brazil, Costa Rica, Mexico, Venezuela). E. Miso additives. F. Miso with seafoods, chicken, and meat. G. Table of equivalents. H. So you want to study miso in Japan? Bibliography. Glossary. About the authors (autobiographical).

Note 1. This is the earliest English-language book seen (July 2000) that has the word “miso” in the title. It is also the first book in the Western world written entirely on the subject of miso.

Note 2. This is the earliest document seen (July 2000) that mentions “Hatcho miso” (spelled that way—which is now the correct romanization). Hatcho is a Japanese place name meaning (approximately) “Eighth Street.”

Note 3. This is the earliest document seen (Sept. 2002) that contains industry and market statistics on individual miso companies.

Note 4. This is the earliest document seen (March 2009) that gives illustrated details about commercial miso production.

Note 5. An advertisement on the inside rear cover of the paperback edition of this book announced that the authors were preparing *The Book of Sea Vegetables*. That book was half researched and written but never published because of concern with pollutants in sea vegetables, and increased interest in soyfoods. Address: 790 Los Palos Dr., Lafayette, California 94549.

678. Shurtleff, William; Aoyagi, Akiko. 1976. *Tamari* (Document part). In: William Shurtleff and Akiko Aoyagi. 1976. *The Book of Miso*. Hayama-shi, Kanagawa-ken, Japan, Soquel, California, and Brookline, Massachusetts: Autumn Press. 256 p. See p. 50, 219-21. Sept. Illust. by Akiko Aoyagi. Revised ed. 1981. New York, NY: Ballantine Books, 620 p. [60 ref]

• **Summary:** In Chapter 5, “Getting started,” in the section



on “Basic ingredients,” is a subsection titled “Tamari” which states (p. 50): “A close relative of shoyu, tamari is prepared from a koji which contains only soybeans and no wheat; it has a distinctive, slightly strong flavor and aroma, a dark brown color, and a fairly thick consistency. Produced either as a byproduct of tamari miso (p. 44) or as a food in its own right, it is now rarely used in its natural form, being generally made into *sashimi-damari* by mixing it with miso-damari (see below), *mizumamé*, cane sugar, caramel, and often preservatives. Although not widely used in Japan, it remains fairly popular in Kyoto and central Japan, where it is used as a seasoning for *sashimi* (raw fish). In ancient times tamari was widely used in its natural form and highly prized as a fine seasoning, having much the same flavor as a best-grade Chinese soy sauce. Today, an increasing amount is made synthetically.

“*Miso-damari*—also called *uwahiki*—is the tamari-like liquid that accumulates in *any* variety of miso during fermentation. Thicker and richer than tamari, it is gathered only in very small quantities and is not sold commercially. A delicious by-product of most homemade miso (it rises to the surface in summer and settles in winter), it may be used like shoyu and is especially delicious with hors d’oeuvres.

In “Appendix A: A brief history of chiang, miso and shoyu,” is a section (p. 219-21) titled “Tamari: The forerunner of shoyu.” Address: 790 Los Palos Dr., Lafayette, California 94549.

679. Shurtleff, William; Aoyagi, Akiko. 1976. Appendix B: Varieties of Chinese chiang, Korean Jang, and Indonesian Tao-tjo [Taucu] (Document part). In: William Shurtleff and Akiko Aoyagi. 1976. *The Book of Miso*. Hayama-shi, Kanagawa-ken, Japan, Soquel, California, and Brookline, Massachusetts: Autumn Press. 256 p. See p. 277-331. Sept. Illust. by Akiko Aoyagi. Revised ed. 1981. New York, NY: Ballantine Books, 620 p.

• **Summary:** Contents: Introduction. Note: Of the romanized Chinese names given in curly brackets below, the first is in the Wade-Giles transliteration; the second is in the more modern pinyin transliteration.

Chinese chiang: Introduction, Red or regular chiang (chunky chiang, hot chunky chiang, Szechwan red-pepper chiang, Hamanatto chiang, Cantonese red chiang, great chiang, yellow-red chiang), black chiang (sweet wheat-flour chiang, black chiang), assorted chiangs (introduction, red-pepper chiang, Canton sweet simmered chiang, dried chiang, other varieties (none of which contain soybeans or grain koji; sesame chiang, peanut chiang, umeboshi chiang, shrimp chiang, corbicula chiang, tangy chiang, semi-fermented chiang)), chiang sauces (bean sauce, hoisin sauce {*hai-hsien chiang*, *haixiang jiang*}, oyster sauce, barbecue sauce, other chiang sauces, none of which contain soybeans or grain koji; shrimp sauce, Chinese Worcestershire sauce, Chinese ketchup). Note 1. The Chinese (Wade-Giles) names and

characters for each of these sauces are given on page 230.

Korean jang: Introduction, Korean soybean jang (*doen jang*), Korean red-pepper jang (*kochu jang*), Mild red-pepper jang (*mat jang*), Chinese sweet black jang (*cha jang* or *chungkuk jang*), Japanese red jang (*wei jang* or *ilbon jang*).

Note 2. This is the earliest English-language document seen (March 2009) that uses the word “kochu jang” (or “kochu-jang”) to refer to Korean-style red pepper and soybean paste (miso).

Indonesian tao-tjo: Summary.

Note 3. This is the earliest English-language document seen (Jan. 2012) that uses the term “chungkuk jang” to refer to a fermented Korean soyfood or seasoning. Actually, the term refers to Korean-style natto which, although it is a salted paste, is fermented using bacteria (*Bacillus subtilis*) and therefore does not belong in a book about miso. Address: 790 Los Palos Dr., Lafayette, California 94549.

680. Shurtleff, William; Aoyagi, Akiko. 1976. The book of miso (Illustrations—line drawings) (Document part). Hayama-shi, Kanagawa-ken, Japan, Soquel, California, and Brookline, Massachusetts: Autumn Press. 256 p. Sept. Illust. by Akiko Aoyagi. [60 ref]

• **Summary:** Continued: Illustrations (line drawings, both numbered and unnumbered) show: The two Japanese characters for miso. Three men “Putting Hatcho miso to bed” by piling nearly round river stones on top of a huge vat; the pyramid shape makes the pile earthquake proof. A child holding a sheaf of grain. A round *zaru* (woven split bamboo tray) with a circle of salt in the middle. A square wooden measure (*isshô-baku*) filled with soybeans. The top of rice and barley plants showing grains and leaves. A wooden vat or red miso tied with rice-straw ropes. A miso maker standing by large wooden vats of two different sizes, with braided bamboo hoops. A well stocked miso shop in Japan (at Kichijoji train station, Tokyo). A woman standing behind two deep earthenware crocks filled with miso; balls of miso are in a basket. A sunken open-hearth fireplace (*irori*) in a traditional Japanese farmhouse with a pot hanging over the coals on a hook (*jizai kagi*) and tofu dengaku being grilled around the coals, their skewers stuck into the ash. Nine wooden kegs of different kinds of miso piled up on 3 levels. A field of soybeans planted in rows. A hand holding soybeans pods still attached to the stem. A soybean pod split open to show the beans. (1) Bar chart of protein from different sources vs. protein returned. (2) Diagram of energy flow through two different food chains, one with a steer in the middle, the other with direct consumption of soy and grains. (3) Development aid from affluent nations as a percentage of GNP (1960-1971). Stylized soybean plant growing out of a stylized Planet Earth. Miso gift pack, with poly bags of rice, barley, and Hatcho miso. A Japanese pipe *kiseru*. (6) Graph of intestinal cancer vs. meat consumption among females in selected countries; the more meat consumed, the more

cancer. Miso aging (from *Miso Daigaku*). (7) The varieties of miso and their characteristics (full-page table). (8) The percentage of salt in different miso varieties. (9a) Map of Japan shows where the different types of miso originate. (9b) Map of Japan showing geographical miso preferences. A head of rice. (10) Famous sub-varieties of salty rice miso. Two heads of barley. Table about two types of barley miso. Two sets of soybean leaves with pods. Table about three types of soybean miso. The Japanese characters for Hatcho Miso. (11) A wooden sign in a Hatcho miso office: "Supplier to the Imperial Household." (12) Two cross-section views of a tamari miso vat. A small pottery crock of sweet simmered miso (*Nerimiso*). Packages of different types of modern miso: Peanut miso, akadashi miso, low-salt, high protein miso, Instant miso soup with dried frozen tofu, leeks, wakame. (14) Different types of miso packaging, both traditional and modern. A sample miso label. (13) Varieties of miso available in the West, plus characteristics of each. Squeezing a bean of miso out of the cut corner of a plastic bag. Three different shoyu containers. Six different types of tofu on a cutting board. (15) Oriental kitchen tools (utensils; full page). A small crock of salt with a wooden spoon in it. Suribachi and modern sesame seed grinder. Tofu preparatory techniques. Broiling tofu with chopsticks on a broiling screen. Four forms of kombu. Two stylized crossed sheaves of rice. A traditional farmhouse kamado (raised earthenware cooking area). Pottery crock. Black and white sesame seeds and plant. Yuzu. Sprig of kinome. Head of garlic. Two burdock roots. Two leeks (*negi*). Making broiled miso. Hoba miso. Kaiyaki miso. Yubeshi miso. Wakame plant. A bowl of miso soup. A woman drinking hot miso soup next to a vending machine. Vegetables cut for miso soup (*mi* or *gu*). Table of the most popular ingredients in miso soup. How to make miso soup at home (4 views). Miso-koshi (woven bamboo strainer). Mad monks grinding miso. (19) Full-page table of miso soup throughout the four seasons. Shiso / beefsteak leaves. Kabocha. Daikon. Irori and jizai kagi (sunken farmhouse fireplace and overhead hanging hook). Woman serving miso by a sunken / open hearth fireplace. Woman kneeling, grinding miso with a pestle (*suri kogi*) in a *suribachi* (serrated earthenware mortar / mixing bowl). (20) Rice patties with nori (*o-musubi*, *o-nigiri*). Bamboo noodle tongs. Homemade noodles in a pot. (21) Broiled mochi wrapped with nori. (22) Steamed tofu. A Chinese cleaver, with its tip stuck into a chopping block. Cultivated shiitake mushrooms growing on a log. Kabocha. Daikon. (23) Miso oden. Doténabé [Dotenabe]. Konnyaku twists. Dengaku Hoshi. Tofu dengaku (2 pieces, skewered; 3 pieces skewered in a box). Japanese eggplant (*nasu*) scored and Shigiyaki. Deep-frying with a wok. Lotus root stuffed with miso. (24) Deep-fried sandwiches. (25) Gashouse eggs. (26) Layered omelets. Japanese bamboo steamer. Kashiwa mochi. Selling miso pickles. Two pickling containers. (27) Salt-pressing. Air-drying daikon and turnips (*kabu*). Miso pickles with tea

and chopsticks. Amazaké at the Nakamura-ro restaurant. How to make miso at home: Utensils, ingredients, and process (7 figures). (29) Miso fermentation crocks. Corona hand-mill. Soft mat koji. (30) Proportions by weight of basic ingredients for various homemade misos; full-page table. (32) Utensils for homemade koji and koji starter. (33) Miso flow chart. (34) Composition of nutrients in 100 gm of basic miso ingredients. (35) Process for homemade rice koji (9 figures). (36) Graph of changes in koji temperatures. Woman leaning over miso vat.

Japanese farmhouse miso: Traditional country farmhouses (2 views). Raised farmhouse kitchen hearth, caldrons and earthenware dais (*kamado*). (38) Farmhouse floor plan. A kura (family treasury and storehouse). Two bamboo colanders. Pounding miso at Suwanose. Making miso in a traditional farmhouse (9 figures). Farmhouse soybean miso made with *miso-dama* (miso balls) (5 figures).

The traditional miso shop: (39) A 17th century workplace (2 figures). (40) Tsujita shop floor plan. Koji trays. (41) Insulated fermentation box. (42) The small tools (full-page). (43) Shop with 2 cauldrons. (44) Steamer and cauldron. (45) A fermentation vat. (46) Shop floor at vat's rim. Preparing traditional rice miso (31 figures). Making koji using natural mold spores. Stacked koji trays. Making miso in a semi-traditional shop (5 figures). Hatcho miso; company and vats (2 views).

The modern factory (2 figures).

A brief history of chiang, miso, and shoyu (incl. evolution of Chinese characters). Hideyoshi Toyotomi and a robber on the bridge (Hatcho miso history). Making miso-damari. Inside a Kikkoman shoyu factory around 1900. Traditional shoyu seller.

Chinese chiang in earthenware jars in a courtyard. Korean jang; selling it and making at home. (48) The interaction of basic miso components during fermentation. (49) Temperature control curves for four quick misos. Edo period shoyu production. Women cutting tofu for dengaku and busy making dengaku, both from the book *Tofu Hyaku Chin*. Cartoon of a man pouring himself sake, thinking of miso soup. Ebisu with fishing rod and big fish under left arm. Tamari shoyu pouring out of spigot at base of miso vat. Traditional Japanese kitchen utensils. Sunken fireplace (*irori*) with huge carved wooden overhead hook hanging from braided rice straw rope. Photo (in Nerima-ku, Tokyo) with brief biography of William Shurtleff and Akiko Aoyagi. Address: 790 Los Palos Dr., Lafayette, California 94549.

681. Ishiwata, Hajimu. 1976. [Studies on *in vivo* formation of nitroso compounds. VII: *In vitro* formation of nitrite by mixing different kinds of foods]. *Shokuhin Eiseigaku Zasshi (J. of the Food Hygienic Society of Japan)* 17(5):369-73. Oct. (Chem. Abst. 86:70351). [7 ref. Eng] Address: National Inst. of Hygienic Sciences, 18-1, Kamiyoga 1-chome, Setagaya-ku, Tokyo, Japan.

682. Liener, Irvin E. 1976. Nutritional aspects of soy protein products. In: Archer Daniels Midland Co., comp. 1976. Edible Soy Protein Seminar. Decatur, Illinois. 220 p. See p. 13-85. Held in 1976 at Moscow, USSR and Warsaw, Poland. [265 ref]

• **Summary:** Contents: Nutritional value of the protein of individual soy products: General considerations, soybeans as a vegetable, soyflour, soybean milk, soybean curd, protein concentrates, protein isolates, fermented products. Blended soy products: Blend with wheat protein, blend with corn protein, blend with rice, vegetable-protein formulations, soy protein as meat extender. Textured meat analogs. Nutritional value of non-protein constituents: Available energy, crude fiber, vitamins (fat-soluble vitamins, water-soluble vitamins), minerals (calcium, phosphorus, zinc, other metals). Antinutritional factors: Heat-labile factors (trypsin inhibitor, hemagglutinins, other heat-labile factors), heat-stable factors (saponins, estrogens, flatulence factors, lysinoalanine). References. Tables.

Concerning lysinoalanine (p. 58-59): "Sternberg et al. (1975) have recently shown lysinoalanine to be widely distributed in cooked foods, commercial food preparations, and food ingredients, many of which had never been subjected to alkaline treatment. Many of these foods had levels of lysinoalanine which were considerably higher than those found in commercial samples of soy protein isolate. The wide distribution of lysinoalanine among commonly cooked foods would tend to indicate that" this is neither a novel protein nor a serious problem, as some humans have long been exposed to proteins containing lysinoalanine with apparent impunity. "Its presence in soy protein can hardly be considered a serious problem for man." Address: Dep. of Biochemistry, Univ. of Minnesota, St. Paul, MN 55108.

683. Ebine, Hideo. 1976. Fermented soybean foods. *INTSOY Series* No. 10. p. 126-29. R.M. Goodman, ed. Expanding the Use of Soybeans (College of Agric., Univ. of Illinois at Urbana-Champaign). [11 ref]

• **Summary:** Contents: Introduction. Miso. Shoyu. Natto. Conclusion. Literature cited. Discussion.

Production of fermented soyfoods in Japan in 1974 was as follows: Miso 587,228 tonnes (metric tons; this miso was made from 191,621 tonnes of whole soybeans, 2,200 tonnes of defatted soybean meal, 102,104 tonnes of rice, 22,280 tonnes of barley, 80,265 tonnes of salt).

Shoyu 1,213,350 tonnes (made from 14,278 tonnes of whole soybeans, 176,138 tonnes of defatted soybean meal, 176,319 tonnes of wheat, 209,674 tonnes of salt).

Natto 90,000 tonnes (made from 47,000 tonnes of whole soybeans). "In 1960 the National Food Research Institute initiated a project to develop a new type of soybean food in order to comply with a request from UNICEF to supply a nutritious protein food for children. The product

thus developed is processed in the following way: soaked soybeans are first cooked in an autoclave at 121°C for 30 minutes. A starter of *B. natto* is then added to the hot, cooked soybeans and mixed well. The inoculated soybeans are fermented at 42°C for 8 to 10 hours. The fermented soybeans are then passed through a chopper and spread over trays for vacuum dehydration. The dried material is made into a powder for use as an ingredient, mixed with wheat flour, in biscuits. In animal feeding experiments this new food had an absorption rate of 83 percent and a biological value of 63 percent, a notable improvement compared with the absorption rate and biological value of raw soybeans."

"An ancient legend indicates that the technology for making soybean foods with the aid of microorganisms originated in China. These foods and the manufacturing process involved were introduced into Japan between 500 and 600 A.D." Address: Applied Microbiology Div., National Food Research Inst., Ministry of Agriculture and Forestry, Tokyo, Japan.

684. Hayashi, Koreichi; Nagao, Kazumi; Tosa, Sachiyo; Yoshioka, Hideaki. 1976. Nattô no eiyô-ka ni kansuru jikken-teki kenkyû. VIII. Nattô tenka-shoku to SHR no ketsuatsu to no kanren ni tsuite [Experimental study on the nutritional value of natto. VIII. The relationship between a diet containing natto and the blood pressure of SHR]. *Teikoku Gakuen Kyo (Memoirs of the Teikoku Women's University)* 2:9-17. [Jap]\*

685. Hayashi, Koreichi; Nagao, Kazumi; Wakabayashi, Keiko; Takahashi, Hiromi. 1976. Nattô no eiyô-ka ni kansuru jikken-teki kenkyû. XI. Nattô-shoku ni okeru reshichin, mechionin, keiran oyobi gyûniku no hosoku kôka [Experimental study on the nutritional value of natto. IX. The effect of substituting lecithin, methionine, chicken, eggs, or beef for natto in the diet]. *Teikoku Gakuen Kyo (Memoirs of the Teikoku Women's University)* 2:19-24. [Jap]\*

686. Komatsuzaki, T.; Ohkuro, I.; Kohno, T.; Ito, S. 1976. [Virulence and lipase of bacillus natto]. *Igaku to Seibutsugaku (Medicine and Biology)* 93:403-08. [Jap]\*

687. Otsuki, Kôzô; Kawabata, Noboru; Taguchi, Kuniko. 1976. Nattô-kin no kintai-gai seruraaze oyobi kishinaraaze [Extra fungal body cellulase and xylanase? of the natto bacterium]. *Kyoto Furitsu Daigaku Gakujutsu Hokoku (Scientific Reports of the Kyoto Prefectural University)* No. 27. p. 21. [Jap]\*

688. Otsuki, Kôzô; Kawabata, Noboru; Taguchi, Kuniko. 1976. Nattô-kin no kintai-gai seruraaze oyobi kishinaraaze [Extra fungal body cellulase and xylanase of the natto bacterium]. *Kyoto Furitsu Daigaku Gakujutsu Hokoku B (Scientific Reports of the Kyoto Prefectural University, B)*

No. 27. p. 21-26. [Jap]\*

• **Summary:** Note: *Webster's Dictionary* defines xylan (a term first used in about 1894) as “a yellow gummy pentosan [a type of polysaccharide, or complex carbohydrate] that yields xylose on hydrolysis and is abundantly present in plant cell walls and woody tissue.” Thus xylanase is the enzyme that hydrolyzes xylan.

689. Otsuki, Kôzô; Kawabata, Noboru; Taguchi, Kuniko. 1976. [Studies on the cellulase and xylanase in the culture medium of *Bacillus subtilis* var. *natto*]. *Kyoto Furitsu Daigaku Gakujutsu Hokoku B (Scientific Reports of the Kyoto Prefectural University, B)* No. 27. p. 11-15. [Jap]\*

690. Takahashi, S. 1976. [Studies on the cause of bitter taste and ammonia in manufactured fermented soybeans]. *Ehime-ken Kogyo Shikenjo Kenkyu Hokoku (Bulletin of the Industrial Research Institute of Ehime Prefecture)* 14:13-18. (Chem. Abst. 87:116606. 1977). [Jap; eng]\*

691. Batra, L.R.; Millner, P.D. 1976. Asian fermented foods and beverages. *Developments in Industrial Microbiology* 17:117-28. [53\* ref]

• **Summary:** “Kenima. This soybean product is known from Nepal, Sikkim, and Darjeeling districts of India. Externally, it resembles Indonesian *tempeh* and is consumed in the same manner: salted, deep-fried, and used as an adjunct to staples such as rice. Soybeans, soaked and dehulled, as described above, are cooked in water for 2-3 hours, presumably inoculated by chance inoculum, and wrapped in leaves of banana or other large leaves. In 24-48 hours at 22-30°C, and sometimes longer, the beans become mucilaginous. No yeasts or filamentous fungi were recovered consistently from the three samples analyzed from Darjeeling, but two rod-shaped, acid-producing bacteria, present at levels of 1-10 million per gram of wet weight, were recovered. Uncooked *kenima* was unappealing to the western taste but when deep-fried and salted, it had a pleasant, nut-like flavor.” A photo shows kinema spread on a mat as sold at market places in northeast India.

Note 1. This is the earliest document seen (Jan. 2012) that mentions kinema (kinema) or that uses the word “kenima” to refer to “kinema.” It is actually much more closely related to natto than to tempeh in consistency, appearance, and type of fermentation organisms used.

Note 2. In 1986 Batra stated that in this 1976 publication the incubation temperature of “kenima” was erroneously reported as 22-30°C; it should have been 35-45°C. Address: ARS, USDA, Beltsville, Maryland 20705.

692. Hitomi, Hitsudai; Shimada, Isao. 1976. Honchô shokkan [A mirror of food in this dynasty. 5 vols.]. Tokyo: Heibonsha. 18 cm. Translation from the 1697 Chinese-language edition by Isao Shimada of the *Pen chao shih*

*chien*. [Jap]\*

• **Summary:** See Hitomi 1695. He died in 1701.

693. Iwadare, Shoji. 1976. Miso, nattô, tôfu kenkô-hô [Miso, natto, tofu: The way to health]. Tokyo: Yomiuri Shinbun-sha. 238 p. Illust. 18 cm. [Jap]

• **Summary:** Soyfoods Center has done a 10-page typed translation of the natto section of this book. Contents: Legends of natto's origin: Pinch hitter in times of food shortage, natto's stringiness surprised people of the Yayoi period (200 B.C.–A.D. 250), Hachimantaro Yoshiie–Natto's first public relations agent (1051-1085), calling out “natto, natto” starting in the Edo period (1603), areas where natto is popular today.

The technical revolution in natto production: Pioneers of commercial natto production (Drs. Yabe, Sawamura, Hanzawa), University Natto sold by Hokkaido University, what kind of natto is most delicious?

The effectiveness of natto: The procreative power of natto bacteria promotes long life in people who eat natto, natto can cure diarrhea, natto suppresses typhus and cholera bacteria (in 1936 Dr. Matsumura, a Kyoto University bacteriologist, found with rabbits that natto bacteria actually killed typhus bacteria), natto does the following—helps people with weak stomach and intestines, prevents intestinal gas, fights cancer (Kameda 1967), prevents radiation harm (via dipicolinic acid, which was first discovered in natto and later found in all bacterial cells; it binds heavy metals like radioactive strontium and expels them from the body), prevents infant milk allergy, contains vitamin B-2 which increases stamina, rejuvenates the cells.

Natto throughout the provinces: Hikiwari natto from Tsugaru, Hikiwari natto from Akita (the birthplace of natto is said to be Oyashin-machi in Yokote city, Akita prefecture; charred soybeans mixed with Yayoi period earthenware pottery from 2,000 years ago have been excavated from ruins at nearby Mt. Komori), Hetsui natto from Saitama prefecture, Naisho mame from Gunma prefecture, small-bean natto from Mito, Tatakai natto from Kyoto, Koru mame from Higo.

Seasonal natto recipes: Spring, summer, fall, winter, all four seasons.

Natto's springiness surprised people of the Yayoi period (200 BC–250 AD): There are various legends regarding the origin of natto but all begin with the meeting of cooked soybeans and rice straw. No documents record this origin. Yet soybeans and rice straw are known to have existed in Japan since the Yayoi period. Perhaps a piece of rice straw fell into a portion of leftover soybeans. In pit dwellings with rice straw roofs, rice straw littered the floor and the rooms were warm. At the proper temperature (how?) the beans would develop stickiness/strings and a good flavor result. The subtle sweetness of rice straw added to the unique aroma. Some may have eaten the natto sprinkled with salt.

Once you've tasted natto you can never forget the flavor. Some women may then have incubated natto next to their bodies overnight in bed. The Yayoi era is concealed in the transmission of Hikiwari natto since ancient times in the northeast prefectures.

There is also the legend that cooked soybeans were offered at household Shinto shrines on which there was often a rope of braided rice straw (*shimenawa*). (The first character of the word natto means "to offer.") The bacteria from the straw may have inoculated the beans; it is generally thought that they were developed in Japan.

Hachimantaro Yoshiie was a general of the Genji clan during the wars of 1051 and 1085. One night during the war the soldiers were cooking soybeans for horse fodder when they were suddenly attacked. They quickly packed the beans into a rice-straw sack (*tawara*), tied the bag to a horse's back and battled for several days. Finally, the battle over, they took the bundle off the warm horse's back and opened it to find that the cooked soybeans had fermented to become natto. In the second war, Yoshiie had captured a fortress in Sankanbu Akita in northern Japan. He wanted to give cooked soybeans to the local farmers as a gift but since he was in a hurry and had no other container, he put them in a rice-straw sack and gave it to them. All were surprised when, after several days, the beans gave off a unique odor and were stringy. The farmers liked the flavor and soon adopted natto as a food. Yoshiie, having enjoyed natto, recommended it to his fellow men. The farmers soon learned of this and began producing natto. The tradition has been passed down from generation to generation.

After his conquests in Northern Japan, Yoshiie's army returned to Kyoto and he taught people along the way how to make natto. The people of Sankanbu in Akita, far from the sea, had little fish or other animal protein in their diet and must have delighted in natto. The route taken by Yoshiie back to Kyoto has been called the 'natto road.'

Page 141: The word "natto" first appeared in 1286 in the *Shinsaru Gakki*, by Fujiwara Myoe,... Address: Tokyo, Japan. President of Manyu Eiyo KK. Teaching at Nihon Daigaku Daigaku-in and Meiji Daigaku Nôgaku-bu. Prof. at Shobirin Joshi Tanki Daigaku.

694. Nippon Torui Kikin Kyokai. 1976. *Daizu ni kansuru bunken mokuroku* [List of documents on soybeans and soyfoods]. Tokyo: NTKK. Vol. 2, post 1961. 93 p. [Jap] Address: Tokyo, Japan.

695. Ortiz, Elisabeth Lambert; Endo, Mitsuko. 1976. *The complete book of Japanese cooking*. Philadelphia, Pennsylvania: M. Evans and Co., Inc.; Dist. by Lippincott. viii + 250 p. Illust. by Marion Krupp. Index. 24 cm.

• **Summary:** A very interesting, well researched, and accurate Japanese cookbook. Each recipe has its Japanese name in large bold letters and a translation directly below in smaller

letters. Soy-related recipes include: Asparagus with malted bean paste (moromi miso & usukuchi shoyu, p. 27). Dengaku (Bean curd with bean paste, p. 28). Stuffed lotus root (with white miso and mustard, p. 30). Noppei-jiru (with namaage or aburaage {fried bean curd}, p. 35). Kenchin-jiru (with tofu and miso, p. 36). Clear soup with okra and bean curd (p. 38). Clear soup with bean curd and wakame (p. 38). Satsuma-jiru (Miso soup with mixed vegetables, p. 45). Miso soup with tofu and shungiku (p. 46). Miso soup with wakame (incl. red and white miso, p. 46). Miso soup with oysters and bean curd (p. 47). Sekihan (pink rice with azuki beans, p. 57). Miso udon (p. 63). Kitsune udon (noodles with aburaage, p. 67). Inari-zushi (fried bean curd stuffed with vinegared rice, p. 79). Sole with bean curd and mushrooms (p. 88). Salmon steamed with bean curd (p. 90-91). Mackerel with red miso (p. 95). Fish marinated in miso (p. 102). Clams in miso, mustard, and vinegar sauce (p. 105). Oysters in vinegared miso sauce (p. 106). Satsuma-age (with mackerel and bean curd cakes, p. 116-17). Oden (with yakidofu {broiled bean curd}, p. 120-21). Kaki no dotenabe (oysters with bean paste, p. 124-25). Yudofu (simmered bean curd, p. 130). Grilled beef with bean paste (p. 146). Nikumiso (chicken and vegetables pickled in bean paste, p. 159). Eggplant with bean paste (p. 163). Green beans with bean paste (p. 168). Daikon with fried tofu (p. 171). Turnips with bean paste (p. 173). Cucumber and soy bean sprouts with sesame seeds (p. 183). Spinach salad with tofu (p. 186).

Bean curd dishes: Fried bean curd (aburaage) with hijiki (p. 187). Sole with bean curd (188-89). Deep-fried bean curd with bonito flakes (p. 190). Kôyadôfu (dried bean curd) with shiitake and vegetables (p. 191). Kûya-mushi (bean curd, chicken, and vegetable custard, p. 192-93). Simmered bean curd and chicken (p. 193). Takara bukuro (treasure bags with aburaage, p. 194). Tofu no shirô-ae (p. 195). Hiya-yakko (garnished cold bean curd, p. 196; Kinugoshi tôfu {silky bean curd} may be used). Chrysanthemum flower bean curd (p. 197). Nabeyaki Denraku [Dengaku?] (bean curd with white and red bean paste, p. 198). Pork with bean curd (p. 198-99). Ni-yakko (bean curd with dried bonito flakes, p. 199). Sokuseki misozuke (instant miso pickles, p. 210). Koshi-an (azuki bean paste, p. 213-15). New year dishes: Kuromame (black soy beans simmered in soy sauce and sugar, p. 220).

Glossary (excellent, p. 228-36)—Soy-related terms: Aburaage, azuki bean, fu (wheat gluten cake), ganmodoki, kinako, kinugoshi tôfu, kôji, koshi-an (powdered azuki paste), kôyadôfu, kôridôfu, kuzuko, miso, misozuke, momen tôfu, moromi miso, namaage, nattô, shôyu, teriyaki, tôfu, umeboshi, usukuchi shôyu, yakidôfu, yuba.

Note 1. This is the earliest English-language document seen (March 2004) that uses the term "silky bean curd" to refer to silken tofu. Address: Both: New York.

696. Ota, Teruo. 1976. *Shokutaku no hakko shokuhin:*

subarashii koyo to katei de no tsukurikata [Fermented foods on your dining table: Their wonderful effect and how to make them at home]. Tokyo: Chisan Shuppan. 290 p. Illust. 18 cm. [30+ ref. Jap]\*

697. Smartt, J. 1976. Tropical pulses. London: Longman. 348 p. Index. [275\* ref]

• **Summary:** In the chapter on “Pulses in human nutrition,” soya beans are mentioned (p. 92-95) under: Germinated seed. Fermented products: Soy sauce, soya bean paste, tempé, natto and Hamanatto. Extracted pulse proteins: Soya bean curd (‘tofu’), soya bean ‘milk.’ Address: PhD, Senior lecturer in Biology, Univ. of Southampton.

698. Wang, H.L.; Mustakas, G.C.; Wolf, W.J.; Wang, L.C.; Hesseltine, C.W.; Bagley, E.B. 1976. An inventory of information on the utilization of unprocessed and simply processed soybeans as human food. Peoria, Illinois: USDA Northern Regional Research Center, Interdepartmental Report. AID AG/TAB-225-12-76. 197 p. AID contract report. Undated. No index. 27 cm. Spiral bound. [65 ref]

• **Summary:** Contents: Introduction. Home and village traditional soybean foods by country. 1. Soybean food uses and production in Asia. Soaking dry soybeans. In China: Tou chiang (soybean milk; preparation, ways of serving), tou fu (soybean curd; yen-lu is the Chinese name for nigari), tou fu nao (soft curd), tou fu kan (dry / firm bean curd), chien chang (pressed tofu sheets), yu tou fu (fried tou fu), tung tou fu (frozen tou fu), tou fu pi (protein-lipid film; yuba), huang tou ya (yellow bean sprout or soybean sprout), mao tou (hairy bean, green soybean, or immature soybean), dry soybeans (roasting and frying, stewing and boiling), roasted soybean flour. Fermented soybean foods. Production and consumption of soybeans (China and Taiwan).

Japan: Tofu (soybean curd), kinugoshi tofu, processed tofu products (aburage or age, nama-age and ganmo), kori tofu (dried-frozen tofu), yaki tofu (grill tofu), yuba (protein-lipid film), soybean milk, gô (ground soybean mash), daizu no moyashi (soybean sprouts), edamame (green vegetable soybeans), whole soybeans, kinako. Fermented soybean foods: Production and consumption.

Korea: Tubu (soybean curd), soybean sprouts, whole soybeans (green soybeans, parched or roasted soybeans, boiled soybeans), soybean flour, soysauce, bean paste [Korean soybean miso], natto (no Korean name is given), production and consumption of soybeans.

Indonesia: Tahu or tahoo (soybean curd), bubuk kedele (soybean powder), tempe kedele, tempe gembus [the name in Central and East Java for okara tempeh], oncom tahu [the name in West Java for okara onchom], other soybean products (soybean sprouts, green soybeans, roasted and boiled soybeans, kecap or soysauce, tauco or bean paste [miso]), food mixtures (Saridele, Tempe-fish-rice or TFR, Soy-rice baby food, soybean residue [okara]-fish-rice),

production and consumption of soybeans.

Thailand. Philippines: Soybean sprouts, soybean coffee, soybean cake (made from equal amounts of soybean flour and wheat flour), soybean milk, tou fu and processed tou fu products, production and consumption. Burma. India. Malaysia. Nepal. Singapore. Sri Lanka (Ceylon). Vietnam. West Asia [Middle East; Iran and Turkey]. References—Soybean food uses in Asia.

2. Soybean food uses and production in Africa. Ethiopia: Injera, wots and allichas, kitta, dabbo, dabokolo, porridge. Kenya. Morocco. Nigeria: Whole soybeans, soybean paste, corn-soy mixtures (soy-ogi). Tanzania. Uganda. Production. References—Soybean food uses in Africa.

3. Soybean food uses and production in Europe [both Eastern and Western]. 4. Soybean food uses and production in Latin America. Argentina. Bolivia. Brazil. Chile. Colombia. Ecuador. Guyana. Paraguay. Peru. Uruguay. Venezuela (fried arepas with textured soy). Mexico: New village process, commercial developments of soy-based food products, Gilford Harrison, Ruth Orellana, Seguras Social. Honduras. Costa Rica. Panama. Dominican Republic. Jamaica. Haiti. Trinidad. References—Soybean food uses in Latin America.

5. Soybean food uses and production in North America. United States: Oriental populations, vegetarian communes, The Farm in Tennessee. Canada. References—Soybean food uses in North America. 6. Soybean food uses in Oceania. Australia. New Zealand. 7. Summary of soybean food uses. Traditional soybean foods: Soybean milk, soybean curd and processed soybean curd products, protein-lipid film, soybean sprouts, tempe (tempeh), green soybeans, boiled soybeans, roasted soybeans, soybean flour, soysauce, fermented soybean paste, fermented whole soybeans [Toushieh, hamanatto], natto, fermented soybean curd. Experimental soybean foods: Whole soybean foods, soybean paste, soy flour, soy beverage. Production and consumption.

8. Recent simple soybean processes, other than traditional. Simple village process for processing whole soybeans: Equipment, process, sanitation requirements, quality of product, evaluation of product in formulas and procedures for family and institutional use in developing countries. NRRC village process. Foods from whole soybeans developed at the University of Illinois (drum dried flakes, canned and homecooked soybeans, soy beverages and beverage products, spreads, snacks).

Ways of cooking and serving soybeans in the American diet. 9. Industrial processes. Industrial production and selling prices of edible soybean protein products. 10. Barriers to acceptability and utilization of soybeans in food and research recommendations: Availability. Cultural and social factors. Texture. Flavor. Nutrition and food safety. Technology development. Technology transfer. Research recommendations [concerning each of the above barriers].

Concerning Morocco: Cereal-soy blends have been

used extensively in Morocco; in fiscal year 1974 some 14.7 million lb were shipped to Morocco. Mmbaga (1975) reported that soy flour is being used in making porridge, with 1 part soy flour to 3 parts maize / corn flour.

Tables show: (1) Soybean production and imports in Taiwan, 1962-1975 (tonnes = metric tons, p. 33). Production rose from a 53,000 tonnes in 1962 to a peak of 75,200 tonnes in 1967, then fell to 61,900 tonnes in 1975. Imports skyrocketed from 62,400 tonnes in 1962 to a record 827,300 tonnes in 1975. (2) Consumption of soybean foods in Taiwan, 1964-1974 (kg/capita/year, p. 34). Total soybean foods not including tofu rose from 1.08 kg in 1964 to a peak of 2.61 kg in 1972 then fell to 1.99 kg in 1974. Consumption of tofu (80% water) rose from 18.75 kg in 1964 to a peak of 33.89 kg in 1972, then fell to 32.04 kg in 1974. (3) Supply and disposition of soybeans in Japan, 1971-1974 (p. 49). Total supply is beginning stocks, plus domestic production, and imports. Total disposition is crushing, plus traditional foods and feed. In 1974 imports accounted for 87.5% of the supply, and crushing accounted for 71.0% of the disposition. (4) Whole soybeans used in the production of traditional foods in Japan, 1970-74 (tonnes / metric tons, p. 50). Tofu and others rose from 508,000 in 1970 to 539,000 in 1974. Miso rose from 177,000 in 1970 to 192,000 in 1974. Shoyu rose from 13,000 in 1970 to 14,000 in 1974. (5) Defatted soybean meal used in the production of traditional foods in Japan, 1970-74 (tonnes / metric tons, p. 51). Shoyu rose from 163,000 in 1970 to 176,000 in 1974. Tofu and others was constant at 130,000 from 1971 to 1973. Miso decreased from 4,000 in 1970 to 2,000 in 1974. (6) Production of traditional soybean foods in Japan, 1970-74 (tonnes / metric tons, p. 52). Tofu and others rose from 1,867,800 in 1970 to 2,264,900 in 1973. Shoyu rose from 1,334,1000 in 1970 to 1,455,800 in 1974. Miso rose from 552,200 in 1970 to 587,200 in 1974. (7) Production and food use of beans [various types] and consumption of some soybean products in Korea, 1964-1967 (p. 56-57). In 1967 consumption (in tonnes / metric tons) was: Bean curd 290,000. Bean sprouts 270,000. Bean sauce 69,700. Bean paste 27,700. Total: 11.6 kg per capita per year. (8) Soybean production in Indonesia, 1960-1974 (p. 65). It rose from 442,862 tons in 1960 to 550,000 tons in 1974. (9) Consumption of soybeans in various parts of Indonesia in 1970 (p. 66). (10) Production of soybean foods in the province of Central Java, 1968-1972 (tons, p. 67). Kecap rose from 914,695 in 1968 to 1,524,000 in 1972. Tahu decreased from 18,570 in 1978 to 17,000 in 1972. Tempe rose from 506 in 1968 to 39,000 in 1972. (11) Area planted to soybeans and total soybean production in Thailand, 1964-1974 (p. 70). Area rose from 213,000 rais (6.25 rais = 1 ha) in 1964 to 1,016,000 rais in 1974. Production (in metric tons) rose from 31,300 in 1964 to 252,400 in 1974. (12) Utilization of soybeans by soybean-consuming countries, 1964-66 (based on FAO 1971 Food Balance Sheets, 1964-66 average, p. 150). The countries leading in per capita

consumption (kg/person/year) are: China (PRC) 6.7. Japan 5.1. Korea(s) 5.0. Singapore 4.3. Indonesia 2.8. Malaysia 2.6. Taiwan (ROC) 1.1. (13) Amounts of cereal-soy blends distributed under Title II, Public Law 480 in fiscal year 1974 (p. 152-155). (14) U.S. exports of full-fat soy flour, 1974-75 (p. 156).

Note: This is the earliest English-language document seen (Feb. 2004) that uses the word “tubu” to refer to Korean-style tofu. Address: Northern Regional Research Center, Agricultural Research Service, Department of Agriculture, Peoria, Illinois 61604.

699. Kagawa, Ryo. 1977. Shokuhin seibunhyô [Food composition tables for Japan]. Tokyo: Joshi Eiyo Daigaku Shuppan-bu. 145 p. Jan. 15 x 22 cm. [Jap]

• **Summary:** For tables of information on soybeans and soyfoods, see p. 21-22. Includes Kinako, soymilk, regular tofu, kinugoshi tofu, fukuro-iri tofu, yaki-dofu, aburage, namaage, ganmodoki, kori-dofu, yuba, okara, natto, hamanatto, miso, red miso, light yellow salty miso, red salty miso, soybean miso, powdered miso. Address: Japan.

700. Birnbaum, Alfred. 1977. Re: Homemade natto, and favorite natto recipes. Letter to William Shurtleff at New-Age Foods Study Center, Lafayette, California, March 23. 1 p. Handwritten (pencil).

• **Summary:** “Homemade nattô: Soak 2 cups soybeans (preferably having been picked over first to remove any split or otherwise undesirable beans) in 4 cups of water for 6-8 hours, or overnight. Cook over low heat approximately 3-4 hours, adding more water if necessary, until beans test soft enough to be mashed between fingers. Strain the beans (saving stock for other cooking uses) and transfer to insulating fermenting boxes (I use plastic tofu tubs in plastic bags which are then wrapped in two layers of towels or blankets and are put in an unlit oven). If one’s fermenting boxes are not too well insulated, rapid completion of this step in order to retain as much of the heat as possible is desirable. Also, inoculating each box of natto with approximately 2T. of “starter”, either natto from the previous batch or commercial natto, or if available, a culture of pure *Bacillus natto*, considerably improves results.

“Allow to ferment 2-4 days (using my makeshift equipment, I allow it to ferment 3 days on the average.) Store in refrigerator or cool place

“The large yellow soybeans most readily available in the U.S. give acceptable results, but smaller varieties such as used in Japanese commercial natto production are best from the standpoints of taste, texture, and appearance.” Address: Tama-sô No. 1, Inokashira 1-28-30, Mitaka-shi, Tokyo 181, Japan. Phone: 0422-47-7130.

701. Kiuchi, Kan; Ohta, Teruo; Itoh, Hiroshi; Takabayashi, Tokuji; Ebine, Hideo. 1977. Studies on lipids of natto.

*Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 32. p. 257-61. March. [16 ref. Eng; jap]

• **Summary:** Reprinted from *J. of Agricultural and Food Chemistry* 24(2):404-07 (March/April 1976). Address: National Food Research Inst., MAFF, Tokyo, Japan.

702. Tanaka, Teruo; Kuroda, Motoko; Sakaguchi, Kenji. 1977. Isolation and characterization of four plasmids from *Bacillus subtilis*. *J. of Bacteriology* 129(3):1487-94. March. [24 ref. Eng]

• **Summary:** The article begins with some background: “Extrachromosomal deoxyribonucleic acid (DNA) elements have been found in sporeforming bacteria such as *Bacillus pumilus* (Lovett et al. 1973, 1975 and 1973), *Bacillus subtilis* (Lovett et al. 1975), and *Bacillus megaterium* (Carlton & Helinski 1969). Lovett and Bamucci (1975) have found two plasmids from *B. subtilis* strains...” The molecular weight of each is given. “Although the function of these plasmids has not been determined, the authors suggested the usefulness of these plasmids for the construction of recombinant DNA molecules.” Recently Lovett and co-workers have succeeded in introducing a *Bacillus pumilus* plasmid into *B. subtilis* where the plasmid expressed its ability to produce bacteriocin (a proteinaceous toxin that inhibits the growth of bacteria).

“If a genetic engineering system were established in *B. subtilis* [instead of in *Escherichia coli*, which is presently used], it would be a safer system, since this group of bacteria is nonpathogenic, grows aerobically [requires air / oxygen for growth], and does not inhabit the human body.”

Contains 7 figures and two tables. Fig. 3 is four electron micrographs of circular plasmid DNA; plasmids pLS11, pLS12, pLS13, and pLS14 are shown.

A plasmid is an extra-chromosomal DNA molecule separate from the chromosomal DNA which is capable of replicating independently of the chromosomal DNA. In many cases, it is circular and double-stranded. Plasmids usually occur naturally in bacteria, but are sometimes found in eukaryotic organisms (Source: Wikipedia).

Note 1. This is the earliest document seen (Jan. 2012) that contains the word “plasmids” (or plasmid) in connection with natto or with the bacterium *Bacillus subtilis* which causes the natto fermentation.

Note 2. This is the earliest document seen (Jan. 2012) that mentions research conducted on the natto bacterium by Teruo Tanaka or Mitsubishi or by the Mitsubishi Kasei Institute of Life Sciences (Tokyo, Japan). Tanaka went on to publish numerous other important papers about plasmids and natto.

Note 3. This is the earliest document seen (Jan. 2012) that contains the word “Extrachromosomal” (or the word “chromosome”) in connection with natto. Address: Mitsubishi Kasei Inst. of Life Sciences, 11 Minamiooya,

Machida-shi, Tokyo, Japan.

703. Kolb, H. 1977. Herkoemmliche Verfahren zur Nutzung von Soja im asiatischen Raum [Traditional processes for using soya in Asia]. *Alimenta* 17(2):41-45. March/April. [35 ref. Ger]

• **Summary:** Discusses each of the following foods briefly and gives sources of further information: Kinako (roasted soy flour), soymilk, yuba, tofu, kori tofu (dried-frozen tofu), aburaage, namaage, kinugoshi tofu, sufu, soy cheese (Western style), soy yogurt, ganmodoki, natto, Hamanatto, koji, tempeh, miso, tao-tjo [Indonesian-style miso], kochujang, shoyu, and ketjap.

Note: This is the earliest German-language document seen (Oct. 2011) that uses the word “sufu” to refer to fermented tofu. Address: Institut fuer Lebensmitteltechnologie, Frucht- und Gemuesetechnologie, Technische Universitaet Berlin, Koenigin-Luise-Strasse 27, D-1000 Berlin 33, West Germany.

704. Matsui, Katsuhiko; Atsusaka, T; Higaki, M.; Sasaki, K. 1977. Purification and properties of leucine dehydrogenase of *Bacillus natto* KMD 1126. *Chemical and Pharmaceutical Bulletin* 25(4):761-66. April. [14 ref]

• **Summary:** Leucine dehydrogenase is an enzyme, which has high substrate specificity. “The optimum pH for oxidative deamination was 10.7, where it was 9.5 for reductive amination. The molecular weight of the enzyme was 360,000 daltons as determined by gel filtration on Sephadex G 200.” It had no antitumor effects on Ehrlich ascites carcinoma bearing mice. Address: Faculty of Pharmaceutical Sciences, Kanazawa Univ., 13-1 Takara-machi, Kanazawa, Japan.

705. Iso, James Y. 1977. Japan looks to the U.S. for more food-quality soybeans. *Foreign Agriculture*. May 16. p. 6, 16.

• **Summary:** When the People’s Republic of China (PRC) cut back on its soybean exports last year because of a poor domestic harvest and disruption of marketing channels by the devastating earthquake, Japanese manufacturers of miso, tofu, and other native soy foods were among the first to feel the pinch, having traditionally bought large quantities of PRC soybeans. Their shift could lead to perhaps a 100,000-ton gain in U.S. exports of food-quality soybeans to Japan.

“In 1976, the U.S. shipped about 520,000 tons of these food-use soybeans to Japan out of total U.S. soybean sales there of 3.2 million tons and Japan’s total soybean imports of 3.5 million. Japan received another 132,000 tons of food beans from the PRC and a few thousand tons from other supplying countries.

“Adding to this a domestic production of 60,000 tons puts Japan’s total soybean use in traditional foods last year at about 750,000 tons.

“Each year, Japan uses about 720,000 tons of soybeans



in traditional foods, including roughly 350,000 tons of tofu (bean curd), 180,000 of miso (bean paste), and 70,000 of natto (fermented beans). The remaining tonnage goes into other native products, such as kinako (processed [dry roasted] beans) and frozen tofu, and into fresh soybean consumption.

“Manchurian beans, produced in the colder regions of North China (usually north of 43° latitude), have long been considered the best tasting for fermented foods like miso and natto.”

“Outside of the PRC, the varieties of beans preferred by the food manufacturers are found in colder climates, such as Canada and the northern regions of the United States.” Several “Japanese trading firms involved in importing food-type beans have come to prefer soybeans produced in Indiana, Illinois, Ohio, and Michigan. These beans, known among the trade as IOM (Indiana, Ohio, Michigan) beans, made up close to 500,000 tons of the food beans imported by Japan last year and go largely into tofu and related foods.” Note: This is the earliest English-language document seen (Jan. 2008) that uses the abbreviation “IOM” in connection with soybeans.

“Around 55,000 tons of ‘identity-preserved’ varieties also were imported last year.” Producers are looking for a large bean with a white hilum and high protein and carbohydrate content. All food beans must be #1 grade quality. Talks with miso/natto manufacturers have revealed that U.S. varieties Amsoy, Corsoy, Kanrich, and Beeson meet this general description. However, a bean with all the desired features comparable to the PRC’s, particularly as related to taste, is not as yet commercially available in the U.S. Address: Foreign Market Development, Oilseeds and Products, Foreign Agricultural Service.

706. Birnbaum, Alfred. 1977. Re: Homemade natto and natto recipes. Letter to William Shurtleff at New-Age Foods Study Center, June 11. 5 p. Handwritten (in pencil) and signed.

• **Summary:** “Dear Bill—I enclose more in the way of nattô recipes, which I hope will prove of interest to you. I also wish to clarify some things in my description of the natto-making process: namely that the bacteria are aerobic and so the fermenting beans should not be placed in air-tight containers (I place my bean-cultures in plastic tofu tubs and cover—but I do not seal—with foil or plastic bags before putting in any insulated environment e.g., wrapping with towels and placing in unheated oven); secondly, more cooking than the cited 3-4 hours may be necessary to achieve the desired degree of softness in the soybeans depending on the pre-soaking time and cooking flame (an all-day ‘slow-cooker’ crock-pot might prove the ideal in cooking the beans, although extremely energy consuming).

“I hope that your research in Indonesia went well and that the upcoming conference on seaweeds will prove equally successful.

“Please let me know if there is anything I might be able to do for you, I hope I will be able to meet you sometime. Gasshô, Alfred.

“P.S. I made my first tofu with the Learning Tree kit from the New-age Center. I know of few investments better than those of acquiring self-sufficiency skills—your teaching has let me know the rewards of making tofu. Thank you.”

“Further suggestions for natto: Use in Okonomiyaki [savory Japanese-style pancakes]. Roll in hakusai [cabbage] leaves in a sudare and top with goma-ae [ground sesame-seed] dressing.”

On pages 2-5 are some of Alfred’s favorite natto recipes: (1) Nattô “cutlets” á la Pokarski—Adapted from a traditional Russian dish. With Paprika sauce. It calls for “1½ c. nattô, ground or blended in a blender or suribachi to a paste (“nattô butter”).

“Yaki nattô or Nattô agé-yaki: Perhaps my favorite nattô dish, enjoyed even by persons who normally dislike the taste of nattô. Spoon natto by the tablespoonful into agé [deep-fried tofu] pouches (4 tablespoons each on the average) and pan-fry in oil or butter over medium heat approximately 3-5 minutes on each side. Drain on drip-screen or paper towels. Serve while still steaming hot with a dip of shoyu, karashi [Japanese-style mustard] and chopped green onions, or grated daikon and ginger.”

Chilaquiles con nattô: An adaptation of a Mexican “platillo pobre” (poor-person’s dish). Sauces for Chilaquiles: Salsa verde (green enchilada sauce), salsa roja (red enchilada sauce), molé poblano (a dark rich chile sauce...).

“I assume that you already have or can easily obtain recipes for the following standard nattô dishes: Nattô shiru [soup]. Iwate nattô mochi (mochi-wrapped nattô). Nattô maki-zushi [natto in sushi]. Nattô-kake soba” [Natto over buckwheat noodles].

Nattô oroshi agé. Nattô aé [six different combinations]. Address: 1048 West 39th Place, Los Angeles, California 90037.

707. Case, Barbara. 1977. Re: Interested in obtaining natto starter. Letter to William Shurtleff at New-Age Foods Study Center, July 18. 1 p. Handwritten, without signature.

• **Summary:** “As stated in ‘The Book of Tofu’—to address questions to your address—I am wondering how I might obtain *Bacillus natto*. Please send any information to me... Thank you.” Address: c/o People’s Co. Bakery, 1534 E. Lake St., Minneapolis, Minnesota 55407.

708. Aoki, S.; Aihara, S.; Kikuchi, K. 1977. [On some conditions of the fermentation process affecting natto quality]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1(1):13-17. [Jap]\*

709. Hayashi, U.; Nagao, K.; Ueda, T.; Kitamura, K. 1977. [Nutritional value of natto with precooked ramen]. *Natto*

*Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1(1):25-36. (Chem. Abst. 91:90001. 1979). [Jap]\*

710. Hayashi, U.; Nagao, K.; Ueda, T.; Kitamura, K. 1977. [Studies on nutrition of natto. X. Effect of various calcium salts on growth of rats]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1(1):63-69. (Chem. Abst. 91:90001. 1979). [Jap]\*

711. Kiuchi, Kan; Ohta, T.; Itoh, H.; Takabayashi, T.; Ebine, H. 1977. Studies on lipids of natto. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1(1):71-80. Aug. [16 ref. Eng]

• **Summary:** “The lipid contents and compositions of three kinds of natto, Itohiki-, Yukiwari-, and Hama-natto, were investigated. The lipid contents of the finished products of Itohiki-, Yukiwari-, and Hama-natto were 5.0, 6.4, and 17.3% respectively. The lipid composition was determined by high-speed liquid chromatographic analysis.”

“When fermented by *Bacillus natto*, the surface of the soybean is covered with characteristic viscous substances consisting of a polymer of glutamic acids. Yukiwari-natto is made by mixing Itohiki-natto with rice koji and salt, aged at 25-30°C for 15 days. Hama-natto is made by using soybean koji.”

Reprinted from *Journal of Agricultural and Food Chemistry* (April 1976, p. 404-07). This paper is part IV of the series “Studies on Lipids in Soybean Foods.”

Note: This is the earliest English-language document seen (Nov. 2011) that uses the word *Hama-natto* (hyphenated) to refer to fermented black soybeans—a completely different food from natto. Address: Div. of Applied Microbiology, National Food Research Inst., Ministry of Agriculture and Forestry, Koto-ku, Tokyo, Japan.

712. Matsui, Katsuhiko; Tamegai, Y.; Miyano, A.; Kameda, Y. 1977. Purification and properties of alanine dehydrogenase from *Bacillus natto* KMD 1126. *Chemical and Pharmaceutical Bulletin* 25(8):2061-66. Aug. [17 ref]

• **Summary:** Alanine dehydrogenase is an enzyme, which has high substrate specificity. Address: School of Pharmacy, Hokuriku Univ., 3 Ho, Kanazawa-machi, Kanazawa 920, Japan.

713. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)*. 1977--.. Serial/periodical. Tokyo: Natto Kagaku Kenkyu-kai. Vol. 1, No. 1. Aug. 1977. [Jap]

• **Summary:** In 1979 published at 1-7-10 Moto Asakusa, Koto-ku, Tokyo 135, Japan.

714. Tanaka, Teruo; Koshikawa, Takako. 1977. Isolation and characterization of four types of plasmids from *Bacillus subtilis* (natto). *J. of Bacteriology* 131(2):699-701. Aug. [9 ref. Eng]

• **Summary:** *Bacillus natto* is now classified as *Bacillus subtilis* by the 8th edition (1974) of *Bergey's Manual of Determinative Bacteriology*. Closed circular deoxyribonucleic acids (covalent) were found in 10 strains of *Bacillus natto*. These can be classified into four types based on their molecular weights and on the patterns formed in agarose gel electrophoresis after digestion. These four types are numbered and described. Address: Mitsubishi Kasei Inst. of Life Sciences, 11 Minamiooya, Machida-shi, Tokyo, Japan.

715. Lemov, Penelope. 1977. Family out: A weekly guide to family dining. *Washington Post*. Sept. 8. p. C12. Section D (D\_C\_12).

• **Summary:** The Mikado Restaurant (4707 Wisconsin Ave., NW), Japanese and moderately priced, offers “Natto, fermented soy beans.” Also fish Teriyaki.

716. *Los Angeles Times*. 1977. Japan: Top market for U.S. soybeans. Oct. 27. p. H25.

• **Summary:** Japan now imports 55,000 tons of soybeans a year from the United States, which makes Japan the leading customer for U.S. soybeans in the world, according to USDA figures.

The Japanese use soybeans in a variety of traditional foods including “tofu (soybean curd of which 10 million bricks are sold daily in Japan), miso (fermented soybean paste, the basis for the soup served in most Japanese restaurants [and homes]), aburage (deep-fried tofu) or natto (fermented cooked soybeans), kinako (roasted soybean powder) and shoyu (soy sauce). The use of soy in bread, biscuits and noodles consumes 15,220 tons of soybeans each year.”

Exports of soybeans and soy products (such as soybean oil and meal) have played an important positive role in the U.S. balance of trade and the U.S. farm economy.

717. Shurtleff, William. 1977. Report on visit to small-scale, modern natto factory in Tokyo, run by Mr. Noboru Ose. Tokyo, Japan. 1 p. Nov. 10. Unpublished typescript.

• **Summary:** This visit was made with Alfred Birnbaum and James Udesky. Contains a detailed description of how natto is made in a modern factory (Ose Noboru Natto, Kugayama 5-7-22, Suginami-ku, Tokyo 168, Japan), which uses 1,200 1,200 kg of dry soybeans daily. The owner is head of the Japanese National Natto Association. Separate color slides also show the process. To make 150 kg (one batch) of finished natto—Ingredients: 90 kg of dry soybeans. 1½ small plastic spoonsful (about 1/16 teaspoon) of pure-culture liquid natto starter (*Bacillus natto*) dissolved in 1.5 liters boiled water.

Wash the soybeans twice thoroughly then soak overnight in water (12 hours in summer, 18 hours in fall or spring, 24 hours in winter). Drain the beans well then place in a large

pressurized steamer. Steam at 14.7 pounds pressure for 25 to 30 minutes, then release the pressure, open the cooker, tilt it forward, and scoop the beans into a large aluminum bowl (4 ft. diameter, 14 inches deep). Allow to stand for 5 to 10 minutes, then thoroughly mix in the inoculant. Discard any excess liquid that settles to the bottom. Run or spoon the beans into a tray, cover them with a sheet of perforated plastic (1/8-inch-diameter holes every 1½ inches), and cover the tray loosely with a plastic lid and put it in the incubation room. Keep at 40-43°C (104° to 108°F) for 14 to 15 hours. Actually the temperature is regulated as follows: It starts at 40°C (104°F) and is gradually increased to 50°C (122°F) at 8 hours; it remains the same until 13 hours. At that time it is gradually reduced to 35°C (95°F) at 15-16 hours. Do not allow the temperature to rise above 55°C (131°F). Once this process is finished, put the tray into a cold storage room and cool for 1 night. The cooling reduces the moisture content through evaporation. Now with plastic boxes the natto cools more slowly.

The traditional natto process: Soak as above then boil at atmospheric pressure for 7 hours. Inoculate as above or (a) mix in natto from a previous fermentation [but it gets bad after 2 to 3 generations since undesirable microorganisms propagate], or (b) use bacteria naturally occurring on rice straw [except that when pesticides and herbicides are used on the rice, the number of bacteria is reduced to about 15% of the natural count]. Wrap hot natto in rice straw and put in the *kotatsu* (charcoal heater under a table covered by a blanket) to get 40°C temperature, then wrap it in a blanket and keep it at this temperature for 2 to 3 days and nights. In the West, a yogurt incubator works well.

It is said that a longer incubation produces better flavored natto. Perhaps short fermentation tastes milder with a subtle vanilla or chocolate flavor, whereas long-incubated natto has a stronger, more distinctive flavor, and more of an alcoholic aroma. Address: c/o Aoyagi, 278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan. Phone: (03) 925-4974.

718. Shurtleff, William. 1977. Report with color slides on trip to Ose Noboru natto factory in Tokyo, Japan. Nerima-ku, Tokyo, Japan: New-Age Foods Study Center. 1 p. Unpublished manuscript. Nov. 10.

• **Summary:** Shurtleff took some color slides of the natto-making process on this one-day trip to this small-scale, modern natto factory in Sugunami-ku, Tokyo, with Alfred Birnbaum and James Udesky. We study, photograph, and write up the process. Mr. Ose is head of the Japanese Natto Assoc. Met Alfred Birnbaum for the first time.

The slides / photos are now in a numbered set as follows:

1. Natto or fermented whole soybeans is a traditional food that originated in the northeast part of Japan over one thousand years ago. The dark brown natto beans have a



sticky-slippery surface so that lifted from a bowl, they form gossamer threads. Natto's flavor and aroma are strong and distinctive, with not-so-subtle ammonia overtones—some people love them, other people don't. Traditionally natto was made and sold wrapped in rice straw as you see to the left. Now it is sold in shallow polystyrene trays.

2. Here you see the beans inside the traditional rice-



straw wrapper; in some farmhouses they are still prepared in this way. Bacteria on the rice straw naturally inoculate the beans.

3. Here are various types of natto packaging used in Japan. Some natto is made with cracked soybeans (*hikiwari natto*), some contains pieces of kombu. Most types are served with a little shoyu (natural soy sauce) and mustard.

4. A typical Japanese supermarket carries a large







selection of natto types.

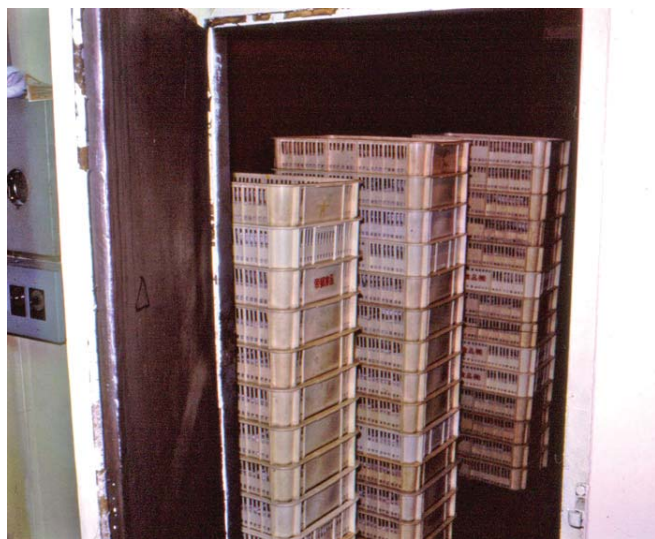
5. To make natto in a modern plant, soaked soybeans are steamed under pressure until tender.

6. While still warm (40°C) they are inoculated with natto starter (*Bacillus natto*). Or they can be inoculated at home with 10 to 20 percent of commercial natto.

7. They are then scooped by hand into individual shallow containers...

8. ... which are closed, placed into incubation racks...

9. ... and stacked in incubation rooms at about 40°C for 15 to 24 hours, after which time they are ready to eat. A whole food requiring no additional cooking, natto is



generally served as a topping for rice or noodles, sauteed with vegetables, or used in soups or Japanese salads (aemono). Today natto is prepared in more than 1,000 commercial shops and is widely available at Japanese food markets in the West. Cracked natto (*hikiwari-natto*) and finger lickin' natto (*yukiwari natto*, containing rice koji and salt) are also popular in Japan. A close relative of natto from northern Thailand, called thua-nao, is sold as a savory paste (containing salt, garlic, onion, and red chilies) or as sun-dried chips. Address: c/o Aoyagi, 278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan. Phone: (03) 925-4974.

719. Hayashi, U. 1977. Japanese natto. Paper presented at Symposium on Indigenous Fermented Foods, Bangkok, Thailand. Summarized in K.H. Steinkraus, ed. 1983. Handbook of Indigenous Fermented Foods. New York: Marcel Dekker, Inc. ix + 671 p. See p. 530-45.

• **Summary:** The section in Steinkraus (1983), titled "Miscellaneous Oriental fermentations" (p. 530-45) discusses two different types of fermented foods: (1) Itohiki natto (from Japan) and Thua-nao (from Thailand); and (2) Hama-Natto (from Japan) and related products (which we call "fermented black soybeans," involving a mold fermentation). However each type is discussed separately,

with part (1, p. 530-45) coming before part (2).

Contents of part (1): Description. Patterns of consumption. Steps in production. Microorganisms. Yields of product. Biochemical changes. Nutritional value. Economics of natto production.

Itohiki natto: In northern Thailand, thua-nao serves as an alternative for fermented fish. In Japan (according to USDA 1958) there were about 800 natto factories nationwide, including roughly 80 in Tokyo.

The essential natto bacterium, *Bacillus natto* is an aerobic Gram-positive, spore-forming rod, closely related to *B. subtilis*. *B. natto* SB 3010 presently seems to be the variety best suited to making natto since its rapid growth on steamed soybeans leads to a partial degradation of protein to amino acids.

Natto mucilage is composed mainly of an acidic glycopeptide. Address: 5-13-11 Minami Tanabe, Higashisumiyoshi-ku, Osaka-shi 546, Japan.

720. Ohta, Teruo. 1977. Japanese natto. Paper presented at Symposium on Indigenous Fermented Foods, Bangkok, Thailand. Summarized in K.H. Steinkraus, ed. 1983. Handbook of Indigenous Fermented Foods. New York: Marcel Dekker, Inc. ix + 671 p. See p. 545-47.

• **Summary:** In Steinkraus (1983) this part is titled "Japanese Hama-natto and related products." Contents: Introduction. Steps in production. Essential microorganisms (incl. Yukiwari natto). Biochemical changes. Outlook for expanded use. Address: Applied Microbiology Div., National Food Research Inst., Ministry of Agriculture, Forestry, and Fisheries (MAFF), Japan.

721. Ishima, T.; Ohta, T. 1977. Statistical analysis of fermentation process in natto making. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1:5-11. [Eng]\*

722. Kedo, S.; Aoki, J.; Ayabe, K.; Hayashi, U. 1977. [On package for processing of natto. II. Influence of preservation in refrigerator]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1:49-58. [Jap]\*

723. Kedo, S.; Hayashi, U. 1977. [Effect of storage on vitamin B-2 content of fermented soybean natto]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1:59-62. (Chem. Abst. 91:106784). [Jap]\*

724. Murata, H. 1977. [Effect of administration of *Bacillus natto* upon weaning piglets]. *Nippon Jui Shikai Zasshi (J. of the Japan Veterinary Medical Association)* 30:645-49. [Jap]\*

725. Nakanjing, K.; Horikawa, C.; Tsugi, A.; Hayashi, U. 1977. [On package for processing of natto. II. Influence of preservation at room temperature]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1:37-48. [Jap]\*

726. Ohkuro, I.; Komatsuzaki, T.; Okamura, Y.; Ito, S. 1977. [Examination for the virulence in lipase active strains of *Bacillus natto*]. *Igaku to Seibutsugaku (Medicine and Biology)* 94:81-93. [Jap]\*

727. Ohkuro, I.; Komatsuzaki, T.; Kawashima, M.; Kuriyama, S. 1977. [Influence of intraperitoneal inoculation of mice with *Bacillus natto* on the mouse weight and fate of the organism]. *Igaku to Seibutsugaku (Medicine and Biology)* 85:231-36. [Jap]\*

728. Sunada, K.; Tsuchiya, T; et al. 1977. [Processing test of natto with soybeans grown for natto]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 1:19-24. [Jap]\*

729. Toya, N. 1977. [Studies on vitamin B-2 production by *Bacillus natto*. IV. Effects of carbon sources and nitrogen sources]. *Kumamoto Joshi Daigaku Gakujutsu Kiyo (J. of Kumamoto Women's University)* 29:85-89. (Chem. Abst. 92:20501. 1980). [Jap]\*

730. Toya, N. 1977. [Studies on vitamin B-2 production by *Bacillus natto*. V. Effect of purine bases and pyrimidine bases]. *Kumamoto Joshi Daigaku Gakujutsu Kiyo (J. of Kumamoto Women's University)* 30:62-65. (Chem. Abst. 92:20502. 1980). [Jap]\*

731. Korean Society of Food Science and Technology. 1977. Comprehensive review of the literature on Korean foods. II. (1969-76). Seoul, South Korea: 235 p. \*  
Address: Korea.

732. Nagayama, Hisao. 1977. *Nattô no shinpi* [The mystery of natto]. Tokyo: Arrow Shuppansha. 220 p. Illust. 19 cm. [14 ref. Jap]

• **Summary:** Contents: 1. The mystery of ancient natto (p. 11). The super power of natto bacteria. The mystery of fermentation and *saru zake*. Anthropoids and natto bacteria. The ancestors of Japanese are elephant hunters. People in the Jomon period were extremely omnivorous. Curiosity and *doki natto* (natto in earthenware containers). Natto that is 2100 years old was excavated. Mysterious Queen Himiko's beauty diet. Ancient natto as medicine.

2. Natto as a secret weapon in military provisions (p. 36). Natto's super power. The mystery of the Natto Road. Legend of the ancient path of Oshu. Oshu natto that went to Kyushu. Kato Kiyomasa's black soybeans (*kuromame*). Natto as a energy source for military commanders in the Sengoku period. The role of soybeans in the Russo-Japanese War. Natto on battleships of Japan's Pacific Ocean fleet in World War II. The German army paid attention to the power of natto.

3. A humorous history of natto (p. 57). Humorous

*Hime Natto*. The mystery of *wara tsuto* (natto in a straw package) and *shimenawa* (a sacred Shinto straw rope and festoon). A petticoat government and *tataki natto* (pounded natto). The popularity of Edo sickness and *natto-jiru* (natto soup). The appearance of *natto-jiru* in classical documents. Natto protein saved the people who survived the great 1923 earthquake in Tokyo. The romance of *Yamataikoku* and longevity foods.

4. The topography of natto (p. 76). Stylized, illustrated map of natto in Japan. College natto in Sapporo. Vegetable natto. Hikiwaru natto in Tsugaru. Kônô natto. Bridegroom and bride natto. Natto musume (natto daughter). Rare taste food of natto "tozo." Hiyama natto in Akita Ondo (a famous folk dance song). *Masamune no Hôryô Natto*. *Deba natto*. *Ichiya natto no kuumondine*. *Goto natto*. *Teramichi natto*. *Hamanatto*. *Hatsu muko to natto wa nibange*. *Aizu no tsurushi natto*. *Sakata no O-shôgatsu sama*. *Yukiguni no daraku-jiru*. *Natto hachi*. *Romantic na hime natto*. *Momen natto*. *Yoi natto, yoi o-shôgatsu*. *Masakado no hoshinatto*. *Nakôdo natto*. *Mito natto*. *Yamaoku no natto-zato*. *Naisho mame*. *Shinobi no natto oke*. *Hettsui natto no ôzuto*. *Isshô natto*. *Natto chinmi no tôzô*. *Arakawa no momen natto*. *Edo no zaru natto*. *Okukido no Heike natto*. *Hate, hate nantoshô*.

Ancient natto. *Hamanatto*. *Natto chanoko*. *Shotoku Taishi no warazutsu natto*. *Ogi natto*. *Tanba no Yamaguni natto*. *Gosho no hôsei natto*. *Kaori no daizu*. *Take no kawa natto*. *Fuyugomori natto*. *Kaga no natto-jiru*. *Kôbashii korumame*. *Munetada natto*.

5. The wonders and medicinal effects of natto (p. 119).

6. Delicious ways of eating and cooking natto (p. 170—with many recipes). 7. An easy method for making natto (p. 202).

A photo on the rear cover shows Mr. Nagayama.  
Address: Shoku Bunka Kenkyusho, Toyotama-kita 4-31, Nerima-ku, Tokyo, Japan.

733. Nosan Gyoson Bunka Kyokai. 1977. *Nôgyô gijutsu taikei*. *Sakumotsu-hen*. Vol. 6 [Outline of agricultural arts and techniques. Crops. Vol. 6]. Tokyo: Nôsan Gyôson Bunka Kyokai. See p. 3-7. [Jap]

• **Summary:** Page 4 shows 2 pie charts with statistics from the year 1974. The 3,500,000 tonnes of whole soybeans consumed in Japan are used as follows: Soy oil 78% of the total, tofu and products 10.5% (except frozen tofu), miso 5.5%, natto 1.5%, frozen tofu 1.3%, kinako (roasted soy flour) 0.4%, shoyu 0.2%, and other 2.6%. The 2,20,000 tonnes of defatted soybean meal are used as follows: Livestock feed 84.6%, shoyu 7.5%, tofu 4.1%, miso 0.3%, other food uses 2.0%, other nonfood uses 1.5%.

A graph on page 7 shows soybean production in Japan and soybean imports. Imports were static from about 1895 to 1918 at about 100,000 tonnes, then they rose rapidly to about 1,000,000 in 1944. They dropped to almost zero following Japan's defeat in World War II, then starting in about 1954, skyrocketed, reaching 1 million tonnes in about



1960, 2 million tonnes in about 1968, and 3 million tonnes in about 1970. After about 1954, soybean production in Japan dropped steadily. Address: Japan.

734. Takahashi Yuzo Kenkyusho. 1977? Tokkyo–Takahashi-shiki junsei baiyo. Katei-yô. Takahasi fukugo kassei nattô-kin [Patent–Takahashi method of pure culture fermentation. For home use: Takahashi complex activated natto bacteria; live cultures for strong natto bacteria (Leaflet)]. Yamagata city, Japan: TYK. 1 p. Undated. [Jap]

• **Summary:** Company name with diacritics is: Takahashi Yûzô Kenkyusho. Uses a question and answer format. Address: Yamagata-shi, Yôka-machi, 2 chome, 1 ban 990-91. Phone: Yamagata (0236) 22-4001.

735. Takahashi Yûzô Kenkyusho. 1977? Nattô seizô no yôten [Key points in natto production]. Yamagata city, Japan: TYK. 6 p. Undated. [Jap]

• **Summary:** Company name with diacritics: Takahashi Yûzô Kenkyusho. Uses a question and answer format. Address: Yamagata-shi, Yôka-machi, 2 chome, 1 ban 990-91. Phone: Yamagata (0236) 22-4001.

736. Asunaro Eastern Studies Institute. 1978. Now offering fall classes in traditional fermented foods: Miso, tamari, tofu, nato [sic, natto], sake, tekka, etc. (Ad). *East West Journal*. Jan. p. 82.

• **Summary:** Classes “taught by Naboru [sic, Noboru] Muramoto, author of *Healing Ourselves*. Also daily cooking classes. Located on 134 acres in Sonoma, California.” For further information, send for brochure. An illustration shows the Asunaro logo. Address: 4600 Cavedale Rd., Glen Ellen, California 95442. Phone: (707) 996-9659 or 938-9846.

737. Fukushima, Danji. 1978. Fermented soybean protein foods in Japan. In: American Soybean Assoc., ed. 1978. International Soya Protein Food Conference, Proceedings. Hudson, Iowa: ASA. 136 p. See p. 39-42.

• **Summary:** There are three major kinds of fermented soybean foods in Japan: Shoyu, miso, and natto. “In Japan, about 439,500 tons of soybeans and defatted soybeans are used as the materials of these fermented soybean foods. Among these, 175,000 tons are used for shoyu, 195,000 tons are used for miso, and 69,000 tons are used for natto.”

Table 1 shows the consumption of soybeans and defatted soybeans in Japan in 1976 for foods (1,026,000 tonnes) and feeds (1,980,000), for a total of 3,006,000 tonnes. Foods are divided into fermented (shoyu, miso, natto; 439,500 tonnes) and non-fermented (tofu and aburage, kori-tofu, and others; 586,500 tonnes). For non-fermented soyfoods 466,500 tonnes of soybean are used for tofu and aburage, 29,000 tonnes for kori-tofu, and 91,000 tonnes for other products.

“Recently, a new fermented drink using soybeans appeared on the market. This product is a drink which is

made by the fermentation of soy milk by lactic acid bacteria. There are many patents related to these kinds of products, including a yogurt type, in Japan. Therefore many new fermented soybean foods may appear on the market in the future.”

Other tables show: (2) Typical composition of different kinds of shoyu. (3) Annual production of purely fermented, semi-fermented, and chemical shoyu in 1976. (4) Annual production of Japanese Agricultural Standard mark shoyu in 1976. (5) Chemical composition of major types of miso.

Figures (flow sheets) show: (1) Shoyu manufacturing process. (2) Rice miso manufacturing process. (3) Natto manufacturing process. (4) Shoyu manufacturing process. Address: Noda Inst. for Scientific Research, Kikkoman Shoyu Co., Tokyo, Japan.

738. Wang, Jun Ryun; Lee, Yang Hee. 1978. Traditional soybean foods in Korea. In: American Soybean Assoc., ed. 1978. International Soya Protein Food Conference, Proceedings. Hudson, Iowa: ASA. 136 p. See p. 43-47. [13 ref]

• **Summary:** “The origin of soy sauce and paste in Korean literature dates back to 683 A.D. (Shinmu King 3rd year of the United Silla period). Since an old Japanese literature [document], *Hwameyruitsuroku* [*Wamyô Ruijusho*; Collections of Japanese Names, by Subject], of Heyan [Heian] records that ‘Maljang (Meju) is a Korean soy sauce and paste’ and a record on Maljang was also observed in the ruins of Nara, it is evident that soy sauce and paste were introduced from Korea to Japan during the Nara period (645-793 A.D.). Therefore, it is believed that the beginning of their consumption in Korea should be in the third century of Kokuryo period.”

“Soybean has been a major protein source in the Korean diet.” In 1976 some 442,803 tonnes (metric tons) of soybeans were used in Korea as follows: oil and defatted meal 28.5%, curd (*tubu*, or tofu) 24.5%, paste (*doenjang*) 18.3%, soy sauce (*kanjang*) 10.6%, soy sprouts (*kongnamul*) 9.0%, hot soy paste (*kochujang*, made from meju, hot pepper flour, and cooked glutinous rice) 6.6%, soymilk (*kongkuk*) 0.14%, and other 2.4%. Other includes roasted soy flour (*konggomul*, used for coating rice cakes [mochi]), fried tofu (*yubu*), salted natto paste (*jeonkukjang* / *cheonkukjang*). *Doebiji* is fresh soybean puree, made by grinding soaked soybeans. When used as a food, it is usually cooked with vegetables, kimchi, and meat. Meju is balls of soybean koji like Japan’s miso-dama. All fermented Korean soybean foods except Joenkukjang are prepared from meju. Its characteristic flavor results from *Aspergillus*, *Penicillium*, and *Mucor* species of molds on the surface of the balls and *Bacillus subtilis* on the inside. Damsuejang is a quick fermented soy paste made by crushing meju to a powder, adding a warm brine solution, then allowing it to ferment and ripen.

Note: This is the earliest English-language document

seen (March 2009) that uses the word “Damsuejang” to refer to Korean-style soybean paste (miso).

The above usage is the equivalent of 12 kg/capita. The daily per capita consumption of soy sauce (kanjang) is 20 ml, of soybean paste (doenjang) is 15 gm, and of hot soybean paste is 10 gm. Most of the soy sauce (64%), doenjang (82%), and kochujang (76%) and all of the salted natto paste (joenkukjang) and quick fermented soy paste (damsuejang) are produced at a household level and consumed directly.

Both soybean production and imports have grown in recent years. In 1970 production was 231,994 tonnes, and imports were 36,291 tonnes for a total of 268,285 tonnes. In 1976 production was 294,949 tonnes (up 27% over 1970), and imports were 147,854 tonnes (4 times as much as in 1970) for a total of 442,803 tonnes (up 65% over 1970). Address: Korea Food Development Centre, Seoul, South Korea.

739. *Toyo Shinpo (Soyfoods News)*, 1978. Aamondo iri tōfu seeru de honkaku hatsubai: Kakihara Jōzō. Aitsugu shinshutsu, ninki yobu aamondo seihin [A start of full-blown sale of tofu with almonds: Kakihara Jōzō. One after another coming out with popular almond products]. Feb. 21. p. 3. [Jap]

• **Summary:** Kakihara Jozo is one of Japan’s oldest natto makers. In the spring of 1977 they started making natto with almonds mixed in. The almonds improve the flavor of natto by reducing the strong smell. The company adds 10-15% almonds by weight in small chunks. 100 gm (regular size) retails for 85 yen, whereas 50 gm (mini size) retails for 40 yen.

The consumption of natto in the Kansai region (Kyoto–Osaka–Kobe) is only about 10% as much as in the Kanto region (Tokyo–Yokohama).

This company used to make shoyu, but they quit making shoyu and started to make miso and natto. Photos show: (1) A man. (2) Various natto products.

740. *Toyo Shinpo (Soyfoods News)*, 1978. Nattō seizō sōchi no gōrika (Jō). I. Nattō to sono seizō setsubi. Nattō Sanbyakuchin [Making nattō making equipment to be more rational and streamlined. I. Nattō and its production equipment. 300 Unique Natto Recipes]. March 11. [Jap]

• **Summary:** *300 Unique Natto Recipes* is a new cookbook, which includes some natto history. A restaurant specializing in natto, having a repertoire of over 300 dishes, is Hotel Sun Route in Awamori. They serve only natto dishes. The owner, Mr. Isamu Naraoka, loves natto and has been developing these recipes for the past 10 years. Examples include: Yamakake ryori, makimono ryori, nimono ryori, mushimono, mizumono, Pikata-fu, agemono, and nabemono ryori.

741. Asunaro Eastern Studies Institute. 1978. School of Oriental medicine and traditional fermented foods (Leaflet).

Glen Ellen, California. 4 panels. Front and back. Each 22 x 14 cm. Undated.

• **Summary:** Classes “taught by Naboru [sic, Noboru] Muramoto. Schedule: (1) Oriental medicine classes. April through September. Monday, Wednesday, Thursday, Friday. 7:30 to 9:30 p.m. (2) Daily cooking classes. (3) Traditional Fermented Food Preparation. Monday, Wednesday, Thursday, Friday, beginning at 9:00 a.m.

“Asunaro Eastern Studies Institute is a newly-established non-profit educational organization...” Located at Top of the World Ranch, it “is 140 acres of forest and open fields with two ponds and four springs and a large 3-level building. The Ranch is located in the Sonoma Mountains (elev. 2,200 feet) overlooking San Pablo Bay.”

“Classes in natural food making (miso, tamari, shoyu, sake, natto, tofu & bran pickles) are conducted from 9 a.m. until completed during the cooler months of the year (October through March). This time is ideal for fermentation processes...” Address: 4600 Cavedale Rd., Glen Ellen, California 95442. Phone: (707) 996-9846.

742. *Toyo Shinpo (Soyfoods News)*, 1978. Nattō seizō sōchi no gōrika (Ge): Bimyō na hakkō no tejun. Kikai-ka, gōri-ka niwa genkai [Making nattō making equipment to be more rational and streamlined. II. Very sensitive fermentation steps. There is a limit to making natto the fermentation natto process mechanical and streamlined]. April 1. p. 4. [Jap]

743. *Toyo Shinpo (Soyfoods News)*, 1978. “Kurorera Nattō” no misuterii: Kishi kaisei naruka. Nisemono ōkō raberu no inshō kiezu. Katō Kiyomasa ga sōshi no setsu mo. Nattō no kigen wa itsugoro? [Chlorella Nattō mystery: If they could only wake up from death and recover? Poor imitation products are on the market, and the bad impressions is not going away. There is a theory that Katō Kiyomasa invented nattō. But roughly when did natto originate?]. April 21. [Jap]

744. Shurtleff, William. 1978. Re: Proposal for establishing a Soycrafters Union or Cooperative in North America. Letter to all “Soycrafters in North America,” April. 2 p. Typed, with signature on letterhead.

• **Summary:** This open letter, written on NAFSC letterhead and dated April 1978, was submitted to *Soycraft* newsletter, where it was published in June 1978 (which see). It led to the first national meeting of soycrafters in Ann Arbor, Michigan, on 28-30 July 1978 and the founding of the Soycrafters Association of North America at that meeting.

The letter begins: “Dear Soycrafters of North America: There has recently been growing interest in North America in starting a Soycrafters Union or Cooperative, perhaps along the lines of Japanese National Tofu, Miso, Shoyu, Natto, etc. Unions [Associations]. Such a development would seem to represent a great leap forward, of benefit to many in the expansion of consciousness and production of quality

soyfoods in the Western world.”

Note 1. This is the earliest document seen (Jan. 2003) in connection with the Soycrafters Association of North America (SANA).

Note 2. This is the 2nd earliest document seen (Sept. 2011) that contains the word “soyfoods.” Address: Director, New-Age Foods Study Center, 278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan. Phone: (03) 925-4974.

745. Sheraton, Mimi. 1978. Restaurants: Stuffed cabbage and sushi on East Side. *New York Times*. June 9. p. C14.

• **Summary:** This is a review of Hatsuhana, a Japanese sushi restaurant at 17 East 48th St., New York City. “Advised by a Japanese friend, we ordered natto, a pungent mix of fermented [soy] beans, tuna fish and scallions; nuta, a sensual blend of raw fluke [flounder, a type of flatfish] and scallions in a satiny yellow sauce made of soy bean paste [miso], lemon and sake.” Also salmon teriyaki, and “wrappings of spinach-green seaweed.” All sushi and sashimi, nuta and natto are recommended.

746. Shurtleff, Bill. 1978. News from New-Age Foods Study Center. *Soycraft (Lawrence, Kansas)* 1(3):3-5. June.

• **Summary:** This open letter begins: “Dear Soycrafters of North America: There has recently been growing interest in North America in starting a Soycrafters Union or Cooperative, perhaps along the lines of Japanese National Tofu, Miso, Shoyu, Natto, etc. Unions [Associations]. Such a development would seem to represent a great leap forward, of benefit to many in the expansion of consciousness and production of quality soyfoods in the Western world.”

The author then summarizes five major functions of Japanese national trade associations related to soy products, and suggests how each of these be adapted to present American conditions and consciousness which are very different from those in Japan: Purchasing soybeans, maintaining a list of member shops, doing “soyfood publicity,” publishing a newsletter, and establishing and running a nationwide center, information clearing house, and school for teaching production of low-technology “soyfoods” to people from both developed and developing countries.

“How might this basic model be adapted to the United States? First, since soyfoods are still quite new in the USA, we might want to form one united front cooperative or union for all soycrafters or producers of soyfoods, rather than trying to form individual unions for tofu & soymilk, miso, tempeh, shoyu, etc. Given such a joint union, it would seem that all of the functions performed by the Japanese unions would be of great potential value to producers in North America. The key point, however, is that for the Union to work it must be financially viable and sound. Thus it must be created and supported by individual members who understand clearly that its functions are in their best interest, both in the short and long run.”

“Second, we must remember that the number of shops presently producing soyfoods here is still very small. We have the names of 95 tofu shops and/or soy dairies in the United States plus 6 more in Canada, 9 tempeh shops, 8 miso shops, and one shoyu factory (Kikkoman). Of these, about 41 of the tofu shops and soy dairies, 5 of the tempeh shops, and 2 of the miso shops are ‘new-age’ types, newly started by Caucasian Americans. This latter group would probably form the initial nucleus of the Soycrafters Union, however after the benefits of membership could be clearly demonstrated, the more conservative Japanese producers might be eventually interested in joining.”

“At the proposed First North American Soycrafters Convention to be held in Ann Arbor [Michigan] July 28-30 the above suggestions might be discussed one by one...”

At the end of the article is a form which new or existing tofu or soymilk manufacturers in the U.S. are invited to fill out and return to Shurtleff so that he can list them in the next edition of *The Book of Tofu*. It asks for the name, address, and phone number of the company, the person(s) in charge, the date tofu or soymilk production started, the approximate cost of getting started, the average quantity of soybeans used per week, the soyfoods produced (in order of importance), the main pieces of equipment purchased, and equipment the company plans to purchase in the near future.

Note the early use of the terms “soyfoods” and “soyfood” in this article. The term “soyfoods” was coined by Surata Soyfoods of Eugene, Oregon, in Dec. 1976.

Note 2. This is the earliest document seen (Oct. 2008) that contains the term “low technology” (or “low tech”). Shurtleff coined this term to refer to soyfoods that could be made, and had long been made, using simple, traditional technologies, appropriate to Third World countries or relatively poor areas. Address: Director, New-Age Foods Study Center, 278-28 Higashi Oizumi, Nerima-ku, Tokyo 177, Japan. Phone: (03) 925-4974.

747. Birnbaum, Alfred. 1978. Re: Natto, the word *kara* and the history of early Japanese-Korean relations, and sea vegetables. Letter to William Shurtleff at New-Age Foods Study Center, Lafayette, California, July 12. 1 p. Handwritten (in pencil) and signed.

• **Summary:** Alfred will try to finish translating the chapter on Nattô from *Daizu Shokuhin* before he leaves Japan for southern California on about Aug. 10; he has found certain scientific terms hard to translate.

He has been reading a somewhat controversial Japanese-language publication titled *Nihon no naka no Kankoku bunka (Korean culture inside Japan)*. It states that the Japanese word *kara* (as in *kara-natto*), meaning simply “from the continent” was first applied to Korea, from Korea’s Sam-Han & Three Kingdoms periods and Japan’s Kofun (A.D. 250-552), Asuka (552-645), and Nara (646-794) periods—before Japan had any relations with China. The first usage was the

Chinese character (1 Cc = 1 Chinese character given) which, although it appears to refer to Han dynasty China, was adapted by the early Korean Japanese “Kara” clan (which Alfred believes later became the *Higashi-no-Aya* clan). The next usage was (1 Cc, pronounced “kara”), as in Sam-Nan clans of Korea and the Karakuni Jinja (4 Cc) in Nara (still extant). Then the character changed to (1 Cc), still meaning “Korea” (not salty), and finally (1 Cc)—all pronounced *kara*.

Note: This is the earliest English-language document seen (Nov. 2011) that contains the term “kara-natto.”

Alfred was introduced to these studies in early Japanese-Korean relations and the falsifications in the *Kojiki* etc. by a Korean linguist in Los Angeles. It became obvious how twisted the stories on the Japanese side became and how anxious the ancient ruling class Japanese (who were largely Korean) was to prove it was separate and unrelated to Korea.

Concerning Hama-natto [from Yamaya]: It is a special product of Hamamatsu, used as an accompaniment to rice, tea, or fried egg yolks. Two sources give two processes.

He still hopes to find time for a trip to Kyoto, and he is still interested in working together on a book about sea vegetables. During Aug. he will stay with his parents in Rancho Palos Verdes, California. From Sept. he will be visiting a friend in Columbia, Maryland. Address: Tama-sô No. 1, Inokashira 1-28-30, Mitaka-shi, Tokyo 181, Japan. Phone: 0422-47-7130.

748. Shurtleff, William. 1978. Re: Proposal to add new categories and information about soyfoods to *Soybean Digest Blue Book*. Letter to Mr. Lynn Munyer, editor, *Soybean Digest Blue Book*, P.O. Box 158, Hudson, Iowa 50643, Aug. 21. 2 p. Typed, with signature on letterhead.

• **Summary:** Contents: Introduction to publications and work of New-age Foods Study Center. Statistics on consumption of traditional soyfoods in East Asia. Tofu. Soymilk. Miso. Shoyu. Tempeh. Natto. Conclusion.

“Worldwide and increasingly in the United States the traditional soyfoods discussed in our books account for an extremely large proportion of world soybean consumption for human diets.

“Therefore we feel it is in the interest of the ASA [American Soybean Association] and American Soybean farmers to do more to introduce these traditional soyfoods to people around the world via your publications.” Address: New-Age Foods Study Center, P.O. Box 234, Lafayette, California 94549. Phone: 415-283-2991.

749. Lachman, Gaella; Elwell, Christian. 1978. Making miso in America. *East West Journal*. Sept. p. 54-59.

• **Summary:** A colorful account of making 1,000 lb of miso in the spring of 1978 with Noboru Muramoto at Asunaro, on Mt. Veeder, at 4600 Cavedale Road, Glen Ellen, California 95442. Phone: (707) 996-5365. Christian writes in the introduction that several years ago, upon returning from

India and recovering with a serious bout with jaundice, he came across Naboru [sic] Muramoto’s book, *Healing Ourselves* (Avon Books, 1973), “one of the few reliable guides to preventive medicine now available.” After this he began to use food as medicine for the first time. Within a year he was attending seminars by Michio in Boston, Massachusetts, and learning about macrobiotics. He later learned that Mr. Kushi and Mr. Muramoto had both been students of George Ohsawa. While in Boston, Christian met Gaella, his wife to be. They left Boston to visit California, and from January to April 1978 they studied at Asunaro Eastern Studies Institute (established in the fall of 1976) in Glen Ellen, California, with Mr. Muramoto. By mid-April, in addition to miso, they had also learned to make soy sauce, saké, tofu, seitan, mochi, bran pickles, sauerkraut, tekka [miso], and bread. Natto making is also taught. A large photo shows the two of them cooking soybeans for making miso.

Note: Talk with Christian Elwell. 1996. Sept. 7. While Christian and Gaella were at Asunaro, Thom Leonard visited for a few days. Thom and Christian met and talked, recognized that they had a lot in common, and stayed in touch afterward. Christian eventually purchased Thom’s Ohio Miso Co. He was already making miso experimentally, and he had plans to go back to Ohio to make commercial miso.

750. Mutual Trading Co., Inc. 1978. Price book: Miyako brand. Fancy Oriental Japanese foods—Importer & Distributor. Los Angeles, California. 60 p. Sept. Index. 22 cm. [Eng]

• **Summary:** Includes: Miso (p. 3-4). Soy sauce and other sauces (p. 4-5). Dried seaweed (p. 32-33). Vegetable (edamame, natto {Miyako brand}, inari age, konbu natto, p. 37). Salted black bean (Chinese, p. 60). Address: 431 Crocker St., Los Angeles, California 90013. Phone: 213-626-9458.

751. Tanaka, Teruo; Sakaguchi, Kenji. 1978. Construction of a recombinant plasmid composed of *B. subtilis* leucine genes and a *B. subtilis* (natto) plasmid; its use as a cloning vehicle in *B. subtilis* 168. *Molecular & General Genetics* 165(3):269-76. Oct. 24. [Eng; ger]\*

• **Summary:** *B. subtilis* stands for *Bacillus subtilis* the bacterium that causes the natto fermentation. Address: Mitsubishi Kasei Inst. of Life Sciences, 11 Minamiooya, Machida, Tokyo, Japan.

752. Kameda, Yukio; Kanatomo, S.; Matsui, K.; Nakabayashi, T.; Ueno, K.; Nagai, S.; Ohki, K. 1978. Nattô-kin no kôshu yôsei. VI. Nattô-kin no sansei suru eerurihi fuku suigan saibô yôkai kassei no kaiseki Antitumor activity of *Bacillus natto*. VI. Analysis of cytolytic activity on Ehrlich ascites carcinoma cell in the culture medium of *Bacillus natto* KMD 1126. *Yakugaku Zasshi (J. of the*

*Pharmaceutical Society of Japan* 98(10):1432-35. Oct. [13 ref. Jap; eng]

• **Summary:** By using the new sheet method, it was shown that the culture filtrate of *Bacillus natto* KMD 1126 had a cytolytic activity on Ehrlich ascites carcinoma cells.

“As a result of the analysis of the cytolytic activity, surfactin (I), protease (II), and an acidic substance (III) were separated from the culture filtrate. I, II, and III had no cytolytic but a mixture of I, II, and III showed cytolytic activity, the same as that of the culture filtrate.” Address: School of Pharmacy, Hokuriku Univ., and Faculty of Pharmaceutical Sciences, Kanazawa Univ. [Japan].

753. **Product Name:** Natto Soybeans (Organic).

**Manufacturer’s Name:** Kendall Food Co.

**Manufacturer’s Address:** 10 White Place, Brookline Village, MA 02146. Phone: 413-238-5928.

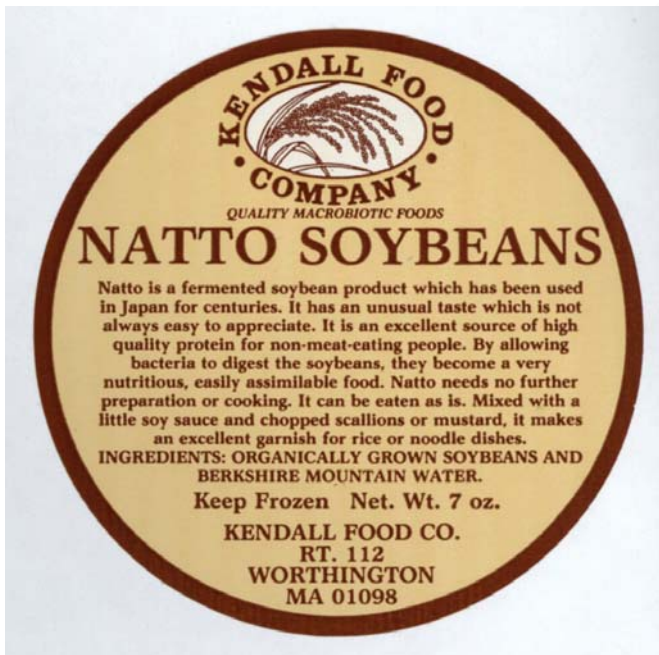
**Date of Introduction:** 1978. October.

**Ingredients:** 1988: Organically grown soybeans and Berkshire mountain water.

**Wt/Vol., Packaging, Price:** 7 oz.

**How Stored:** Frozen.

**New Product–Documentation:** Letter from John Paino.



1982. April. Charles Kendall made this natto and sold it to markets in New England and New York.

Note: Charles Kendall was the earliest known Caucasian maker of commercial natto in the United States.

Label sent by Charles Kendall, founder and owner of Kendall Food Co., Rt. 112, Worthington, MA 01098. 1988. Round. 3 inch diameter. Brown on warm yellow. “Kendall Food Co. Quality Macrobiotic Foods. Natto Soybeans. Natto is a fermented soybean product which has been used in Japan for centuries. It has an unusual taste which is not always

easy to appreciate. It is an excellent source of high quality protein for non-meat-eating people. By allowing bacteria to digest the soybeans, they become a very nutritious, easily assimilable food. Natto needs no further preparation or cooking. It can be eaten as is. Mixed with a little soy sauce and chopped scallions or mustard, it makes an excellent garnish for rice or noodle dishes. Ingredients: Organically grown soybeans and Berkshire mountain water. Rt. 112, Worthington, Massachusetts 01098.”

Talk with Charles Kendall. 1988. Jan. 26. He and his bride-to-be enjoyed natto in the summer of 1976 before he founded Kendall Food Co. They would go out drinking then go to a Japanese food store and buy Hime Natto. But at \$0.89 for a little packet it was too expensive and not that good. So they began experimenting making their own at home. They had many problems getting good quality. By the fall of 1978 they were selling small quantities when they were in Boston. They fed it to their son 3 months after he was born. It clearly improved his digestion with stools that were less gassy and watery. But he first really learned to make it in 1981 at Worthington. Nowadays natto sales are increasing but are still small; on average he makes 100 lb/week, which is 200+ 7-oz containers. Each is round plastic. This week was 300-400 containers. There are many tricks, not just time and temperature. The layer of beans must be thin, not more than 1 inch deep. Pressure steaming is the key to good stickiness. Correct aeration and not letting the beans get too hot. Adding the starter when the beans are the right temperature. He learned by trial and error, not from any person or book. He uses a powdered starter purchased from Japan. He dissolves it in water in a watering can and sprinkles it over the soybeans. Of his total sales, natto comprises only about 10%. Amazake and mochi are 45% each. About 2 years ago Macromuse did an article on his company.

Talk with Showshawme of Transformational Research, Boulder, Colorado. 1996. March 12. Outside of the Massachusetts area, Charles Kendall presently sells his natto only by mail order, shipped via UPS overnight red label. The customer must buy one case, which is 30 x 5 oz packages. They are shipped frozen but not deep frozen. Consumers store them refrigerated, or re-freeze them. Showshawme just purchased one case, which cost \$1.40 per package (\$58.80 for the natto) plus \$42.00 for the shipping. The shipping cost increases the further away from Massachusetts you live.

Talk with Sjon Welters. 1997. May 15. He just visited Kendall. 90% of Kendall’s income is from selling natto, mostly to Japanese-Americans. The other 10% comes from amazake.

Talk with Charles Kendall. In 1981, he started using the round label he sent to Soyfoods Center in 1988. His original natto label was small, rectangular, printed black on white; but he cannot find any of those original labels. Talk with Charles Kendall. 2006. Aug. 7. He first sold natto in the fall of 1978.

754. Shurtleff, William. 1978. Protein source for the future. *PHP (Japan)*. Oct. p. 8-18, 79-82. Illust. 18 cm.

• **Summary:** Contents: Introduction. Ten reasons why soybeans will be the protein source of the future: 1. Optimum land utilization. 2. Lowest cost source of protein in almost every country of the world. 3. High nutritional value. 4. Time tested for over 2,000 years. 5. Remarkably versatile. 6. Appropriate technology (“Traditional soyfoods can be produced in cottage industries”). 7. New dairylike products. 8. Soybeans are hardy and adaptive. 9. Free nitrogen fertilizer from nodules on soybean plants. 10. Great productivity potential.

Discusses new patterns of soy protein utilization, with specific reference and descriptions of tofu, soymilk, tempeh (“Indonesia’s most popular soyfood”), miso, shoyu, whole dry soybeans, roasted soybeans, fresh green soybeans, soy flour, kinako, soy sprouts, and textured soy protein (TVP), yuba, and natto. Concludes with a discussion of new developments in the Western world. Address: New-Age Foods Study Center, P.O. Box 234 (951½ Mountain View Dr.), Lafayette, California 94549. Phone: 415-283-2991.

755. Hittle, Carl N. 1978. Soybean potential in Nepal: A report. Mimeographed, spiral-bound manuscript. 30 p. 28 cm. [26 ref]

• **Summary:** Dr. Hittle served as a soybean consultant in Nepal from Sept. 23 to Oct. 11, 1978. Contents: 1. Introduction. 2. Terms of reference for soybean consultant. 3. Background information: Soybean production, production research, evaluation of germplasm, local varieties and selections, preservation of soybean germplasm, rhizobial microbiology, economics of soybeans, soybean statistics, present uses of soybeans in Nepal, Food Research Services of the Ministry of Food, the dairy industry in Nepal, solvent extraction, CARE, UNICEF. 4. Observations at the research stations: Kakani Hill Station, Pakhribas Agricultural Centre, Lumle Agricultural Centre, Central Research Station–Khumaltar, Bhairawa Agricultural Farm, Rampur Agricultural Experiment Station, National Rice Station–Parwanipur.

Note 1. The first 3 stations are located in the hills, Khumaltar is in the Kathmandu Valley, and the last 3 are located in the plains (Tarai [Terai]).

5. Comments and suggestions: Priority of soybeans, operational work plan, assignment of national staff, assignment of international staff, training, linkages, a national soybean research center. Appendixes. I. Itinerary of C. N. Hittle. II. Persons met by soybean consultant. III. List of background information. IV. Sarbottam Pittho (Super Flour made from 50% soybeans). Uses of soybeans.

The soybean is an ancient crop in Nepal. Generally its culture has been restricted to terraces and valleys ranging from 500 to 1,500 meters (1,642 to 4,925 feet) in altitude.

Soybeans are usually grown at lower altitudes in single rows on the bunds of rice paddy fields, or at higher altitudes as an intercrop with maize or millet. Hectarage is difficult to estimate; estimates made from 1976 to 1978 range from 10,000 to 70,000 hectares. Yields are low, ranging from 300 to 500 kg/ha. This is because of the two ways soybeans are traditionally grown, because they rarely have been grown in the Tarai [Terai] (plains area) where higher yields can be expected, and because little emphasis has been given to developing superior varieties and cultural practices.

Soybeans are used mainly for human food in Nepal by “roasting the dried seeds (parching) or as green vegetables (boiling or frying the green pods followed by shelling of the seeds and eating the green soybeans). Parched soybeans are frequently mixed with popped maize (corn) and eaten daily as tiffin. Green soybeans are frequently mixed with other vegetables to make curry. A snack food is prepared by removing the seed coat of parched soybeans, splitting the cotyledons and mixing with garlic, salt, and chilli powder. Sprouted soybeans are mixed with other sprouted pulses and used as vegetable soup. Fermented soya products include soya sauce and kirima [kinema].”

Soybeans are one of the main sources of protein for the majority of the people in the Hill regions. Only small quantities of soybeans reach the market.

Note 2. This is the earliest document seen (Jan. 2012) that uses the alternative spelling “kirima” to refer to kinema, a fermented soyfood from Nepal and a close relative of Nepalese kinema and Japanese natto. Address: Soybean consultant in Nepal.

756. Cherepenko, E.I.; Tikhonova, T.N. 1978. [Heterologous transformation: search for an explanation for the improved efficiency of *Bacillus natto* DNA]. *Tsitologiya i Genetika (Cytology and Genetics)* 12:109-14. (Chem. Abst. 89:20098). [Rus]\*

757. Nakano, S.; Kato, Y. 1978. [Effect of ascorbic acid supply to a natto diet on the growth of rats. II. Urinary excretion of ascorbic acid in rats fed a natto diet supplemented with ascorbic acid]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 2:69-73. (Chem. Abst. 91:90030). [Jap]\*

758. Ohkuro, I.; Komatsuzaki, T.; Kawashima, M.; Kuriyama, S. 1978. [Influence of sodium chloride on colonies and lipase of natto bacilli]. *Igaku to Seibutsugaku (Medicine and Biology)* 97:171-74. (Chem. Abst. 91:52616. 1979). [Jap]\*

759. Suemitsu, R.; Sasakawa, K.; Hori, T.; Yamamoto, H.; Sawai, M. 1978. [Production of maltose by immobilized *Bacillus natto* H74-B cells]. *Doshisha Daigaku Rikogaku Kenkyu Hokoku (Scientific and Engineering Review of*

*Doshisha University*) 19:22-30. [Jap]\*

760. Suemitsu, R.; Chinzei, H.; Idei, K. 1978. [Isolation and identification of surfactin from the culture broth of *Bacillus natto* H74-B]. *Doshisha Daigaku Rikogaku Kenkyu Hokoku (Scientific and Engineering Review of Doshisha University)* 19:139-45. [Jap]\*

761. Suzuki, T.; Ohta, T. 1978. [Studies on the properties of commercial natto starters]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 2:33-39. Reprinted in: *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* 34:266-72. 1979. [Jap]\* Address: Japan.

762. Takahashi, F.; Hiram, K.; Torano, E. 1978. [Effect of ascorbic acid supply in a natto diet on the growth of rats]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 2:53-61. (Chem. Abst. 91:90029. 1979). [Jap]\*

763. Yamamoto, T.; Harabuchi, Y.; Mukai, M.; Kedo, S.; Naruse, A.; Hayashi, U. 1978. [Studies on *Bacillus natto*. I. Making natto by continuous cultivation]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 2:41-52. [Jap]\*

• **Summary:** The title may be: Effect of number of inoculations in media on production of sticky material. Address: Japan.

764. Yano, R.; Koto, R.; Takeda, K. 1978. Carbon dioxide content in natto. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 2:75-78. (Chem. Abst. 91:122369). [Eng]\*

765. Abehsera, Michel. 1978. *Cooking with care & purpose: menus for strength and peace of mind.* Brooklyn, New York: Swan House Publishing Co. 271 p. Index. 21 cm. \* Address: Brooklyn, New York.

766. Beuchat, Larry R. 1978. *Food and beverage mycology.* Westport, Connecticut. AVI Publishing Co. x + 527 p. See p. 224-42. Illust. Index. 23 cm. [300+\* ref]

• **Summary:** Chapter 9, "Traditional fermented food products" (p. 224-53), by Larry R. Beuchat, is cited separately.

In Chapter 13, "Metabolites of Fungi Used in Food Processing" (p. 368-96), by R.J. Bothast and K.L. Smiley, the section on enzymes (p. 378) begins: "Fungal enzymes have been used for hundreds of years, especially in the Orient. However, modern industrial enzyme technology probably started with Takamine (1894) [Note: In Sept. 1894 he was issued two U.S. Patents for "Process of making diastatic enzyme," Nos. 525,820 and 525,823] and his work with *Aspergillus oryzae*. Today many industrial enzymes are of fungal origin." These include  $\alpha$ -amylase (from *Aspergillus*

*oryzae* and *A. niger*), glucoamylase, pectic enzymes or pectinases, naringinase, invertase (sucrase),  $\alpha$ -galactosidase, lactase (Beta-D-galactosidase), protease (from *Aspergillus oryzae*), rennet (called rennin, if pure; from *Mucor pusillus*, *Mucor miehei*, or *Endothia parasitica*; used in many types of cheeses), and glucose oxidase, cellulase, lipase, catalase.

There are also chapters on: 14. "Mycotoxins," by N.D. Davis and U.L. Diener. 15. "Methods for detecting mycotoxins in foods and beverages," by L.B. Bullerman. 16. "Methods for detecting fungi in foods and beverages," by B. Jarvis. Address: Assoc. Prof., Dep. of Food Science, Agric. Exp. Station, Univ. of Georgia, Experiment, GA.

767. Beuchat, Larry R. 1978. *Traditional fermented food products.* In: L.R. Beuchat, ed. 1978. *Food and Beverage Mycology.* Westport, Connecticut. AVI Publishing Co. xi + 527 p. See p. 224-53. Chap. 9. [69\* ref]

• **Summary:** Contents: Introduction, Koji. Soybeans: Shoyu, miso, natto (incl. itohiki-natto, yukiwari-natto, and hama-natto / hamanatto), sufu, meitauza, témpé. Peanuts: Oncom. Rice: Lao-chao, ang-kak, idli. Maize: Ogi, kaanga-kopuwai, injera. Cassava: Tapé, gari. Taro (*Colocasia esculenta*): Poi. Cacao beans: Cocoa, chocolate, and chocolate liquor are products derived from cacao fruits (*Theobroma cacao*).

Tables show: (1) Some fermented foods of fungal origin. For each food is given: Product name, geography, substrate, microorganisms, nature of product, and product use. Soy-related products include: Chee fan, Chinese yeast, Hamanatto, ketjap, meitauza, meju, miso, shoyu, sufu, tao-si, taotjo, and témpé.

"Yukiwari-natto is made by mixing itohiki natto with rice koji and salt, and aging at 25 to 30°C for about two weeks." Note 1. Yukiwari natto is natto resembling miso, featuring the stickiness (*nebari*) of natto and the sweetness of koji. It is made by a two-step fermentation. Another process: (1) Make the natto and the koji, separately. (2) Mince natto finely and mix it with koji, shoyu, and dashi made from kombu. Ferment at 30-33°C for 30-40 days.

Note 2. This is the earliest English-language document seen (Aug. 2006) that mentions the term yukiwari-natto (or yuki-wari natto). Address: Dep. of Food Science, Agric. Exp. Station, Univ. of Georgia, Experiment, GA.

768. Faryna, Paulette J. 1978. Soybeans in the Nigerian diet. *Ahmadu Bello University, Extension Bulletin.* No. 21. 74 p. Home Economics Series No. 1. Reprinted in Nov. 1985. [64 ref]

• **Summary:** Contents: Acknowledgements (especially Mrs. V. Ogunsola of Home Economics Section, Samaru College of Agriculture, and Mr. T. Kay, Dept. of Chemical Pathology, Ahmadu Bello Univ., Zaria). Foreword. The history of soybeans. The role of soybeans in the diet. Soybeans in Nigerian weaning foods. Protein deficiencies. The preparation of soybeans. Soybeans enriched paps

and porridges. Soyabean soups. Soyabeans as a meal on their own. Soyabean patties. Soyabean sweet snack foods. Soyabean breads. Fermented soyabean products: Soyabean Daddawa, Soyabean Sprouts. Soyabean oriental delicacies: Tofu (curded with lemon juice, vinegar, kuka [the fruit of the baobab tree], calcium sulphate, or epsom salts), Basic Fried Tofu, Soyabean Cheese (with okara), Soy Yogurt. Appendix: Measurements. Home made ovens. Soyabean feeding trials with infants. References.

Includes 67 Nigerian-style recipes. Soybeans are used mostly in the form of “soybean paste” (fresh soy puree or *gô*) and homemade whole soy flour. To make the paste: Soak soybeans overnight, dehull by hand and float off hulls, grind cotyledons with a small amount of water, use in a cooked preparation. To make flour: Boil beans for 30 minutes, wash, soak in two times the volume of water for 12-24 hours, change water every 4-6 hours, sun-dry, grind.

Soybeans were introduced to Nigeria in 1908, and most of the early research was carried out at the Moor Plantation in Ibadan. Germination of the imported seeds was a major problem, leading to the failure of early attempts to grow soybeans in Southern Nigeria. However subsequent trials in the Guinea Savannah belt proved successful. In 1928 soybeans were successfully grown at the Samaru Experimental Station. This success encouraged the development of a programme which eventually resulted in the distribution of seed to subsistent farmers in order to establish soybeans as a cash crop. A world shortage of oil seeds immediately after World War II accelerated the drive for increased soybean production in Nigeria.

A map (Fig. 1, p. 2) shows the main soybean growing area in Nigeria, which is in the Southern Guinea Zone; here a rainy season of 5 months or more discourages the cultivation of groundnuts and cowpeas. Benue state is the main soybean growing area, followed by the Abuja area in Niger State and the southern divisions in Kaduna State. The crop is planted in small holdings of 1 to 2 hectares per farmer. The most common variety planted is the Malayan variety.

Table I shows Nigerian soybean production and market value from 1957-58 to 1972-73. The peak production year was 1962-63 (26,450 long tons); only 234 tons were produced in 1972-73. Address: Extension Home Economist, Ahmadu Bello University, Agricultural Extension and Research Liaison Services, P.M.B. 1044, Samaru-Zaria, North Nigeria.

769. Ford, Barbara. 1978. *Future food: Alternate protein for the year 2000*. New York, NY: William Morrow and Company, Inc. 300 p. Index. 22 cm. [40+ ref]

• **Summary:** The author concludes that soybeans are most likely to be the protein source of the future. Chapter 2, “The Cinderella Bean” (p. 32-53) and Chapter 3, “Soybeans, Oriental Style” (p. 54-71) both discuss the benefits of soybeans. Pages 37-38 note that soybeans were once called

“haybeans” and their hay was called “haybean hay.”

Note: This is the earliest English-language document seen (Oct. 2011) that which uses the term “haybean” or “haybeans.”

The work of the USDA Northern Regional Research Lab. (NRRL) with soyfoods is described at length. While at the NRRL she first encountered “sufu.” In “Chinese markets, sufu is not called sufu but ‘bean curd’ or ‘bean cake.’ As soon as I saw sufu I realized it has an image problem—not as unappetizing as natto, but distinctly unpleasant. Picture grayish chunks of some odd-looking material floating in a murky liquid, like biology specimens in a bottle, and you have a typical bottle of sufu.

“Sufu looks so bad that my husband, who has faithfully eaten a number of odd-looking sources of protein that I have purchased over the years, refused it. It took a little courage for me to tackle one of the grayish lumps myself but I finally ate one. To my surprise, it was good, rather like a tangy dairy cheese but with a distinctive, nonbeany flavor of its own” (p. 60-61).

Chapter 6, “It Ain’t (Just) Hay,” is about alfalfa leaf protein and leaf protein concentrate. Research on leaf protein “really started during World War II, when British scientist N.W. Pirie suggested the use of leaves to augment dwindling meat supplies... Pirie’s proposal never got underway during the war because of the costs involved, but after the war he was given a laboratory where he carried out most of the pioneering work on leaf protein.”

Chapter 9, “SCP: Promises, Promises,” is about single-cell proteins such as the bacteria *Cellulomonas* and *Pseudomonas* (the champion, which can double its weight in 9 minutes). A probable culprit in SCPs is “nucleic acids, which have been shown to cause elevated uric acids in humans if used over an extended period of time. Raised uric acid levels lead to gout, kidney stones, and gallstones. Some bacteria contain from 15 to 16 percent nucleic acids, a fairly high level. Yeasts and fungi contain from 6 to 11 percent, still a high level. Algae have less.” It is recommended that humans not consume more than 2 grams (0.7 ounces) of nucleic acids per day. Address: USA.

770. Frazier, W.C.; Westhoff, D.C. 1978. *Food microbiology*. 3d ed. New York, NY: McGraw-Hill Book Co. xvi + 540 p. Index. 24 cm. [400+\* ref]

• **Summary:** Contents: 1. Food and microorganisms. 2. Principles of food preservation. 3. Contamination, preservation, and spoilage of different kinds of foods. 4. Foods and enzymes produced by microorganisms. 5. Foods in relation to disease. 6. Food sanitation, control, and inspection.

In the section on “Oriental fermented foods” (p. 387-91), the following soy-related foods are mentioned: Koji (*chou* in Chinese), soy sauce, tamari sauce, miso, tempeh, natto, soybean cheese or *tou-fu-ru*. Address: 1. Univ. of Wisconsin



2. Univ. of Maryland.

771. Kawakami, Kozo; Shinoda, Osamu; Hirata, Mario; Matsushita, Sachiko; Yoshikawa, Seiji. ed. 1978. Ryōri bunken kaidai [Bibliography of ancient documents on Japanese foods, each extensively annotated]. Tokyo: Shibata Shoten. 298 p. Illust. 22 cm. Discoveries in Food Culture series, Vol. 5. [304 ref. Jap]

• **Summary:** Part I of this work lists 200 old Japanese food/cookery books, each published prior to 1868, in alphabetical order. This book is exceptionally well researched and valuable. The author was born in 1928. The name of each is written in Chinese characters (*kanji*) with *furigana* attached to show how to pronounce them. (Unfortunately, no pronunciation help is given with authors' names.) The publication date and a 1-page summary of the contents is given. These 200 books were selected from well over 500 candidates based on 5 rules: They are not about medicinal uses, crop cultivation, or industrial food production (including oil extraction, flour milling, etc.); in the fields of confectionery and pickles, only the most famous books are included; some exceptions to the first four rules were made where inclusion was deemed of special interest to the reader.

Part II is 104 related books about food and cooking, listed chronologically.

Appendix 1 explains how to do research using old documents. Appendix 2 is a chronology of the 200 books from the year 1200 to the present. Appendix 3 is an index to the books in Part II, listed alphabetically by title. Note: There is no index in this book that allows one to see on which pages or in which books a certain food (such as natto) is mentioned. Address: Nōgaku Hakase, Shusai, Ryori Genten Kaidai, Japan.

772. Smith, Allan K.; Circle, S.J. eds. 1978. Soybeans: Chemistry and technology. Vol. 1. Proteins. Revised. Westport, Connecticut: AVI Publishing Co. xiii + 470 p. Illust. Index. 24 cm. [500+ ref]

• **Summary:** This revised edition contains relatively few, unimportant changes from the original, classic 1972 edition. The following changes have been made: Addition of a 7-line preface to the "revised second printing" dated 4 Oct. 1977, updating of a graph of U.S. soybean production (p. 1). Updating (to 1976) of a table on U.S. and world production of important oilseeds (soybeans, cottonseeds, peanuts, sunflower, rape, sesame) (p. 2). Minor textual changes on pages 18-19. Addition of a table showing distribution of the 3 leading soybean varieties in 14 major states and the percentage of acreage harvested for each variety in 1976 (e.g., in Illinois, Williams accounted for 25.1% of harvested acreage, Amsoy 17.3%, and Wayne 12.8%). And updating of a table on U.S. soybean production by state showing acreage harvested, yield per acre, and production for 1974, 1975, and 1976 (p. 32).

The foreword, chapter titles, and index have not been changed at all. Note: Vol. 2 was never published. Address: 1. Oilseeds protein consultant, Hot Springs, Arkansas; 2. Oilseed protein consultant, Protein Technology, Richardson, Texas.

773. Yanwar, Afrida Nazir; Saparsih, Sri Budhi. comps. 1978. Selected abstracts of traditional fermented food. Jakarta, Indonesia: National Scientific Documentation Center, Indonesian Institute of Sciences (PDIN-LIPI). iv + 470 p. Author index. 29 cm. [506 soy ref]

• **Summary:** These are abstracts of documents published from 1910 to 1976 on traditional fermented food, particularly of food prepared and consumed in Southeast Asia and the Far East. Each chapter is divided into 6 sections: Method of preparation, microorganisms, fermentation studies, nutritive values, other influence in the foodstuff, storage. Within each section, the references are listed alphabetically by author. The source of most of the references is *Chemical Abstracts*, to which an exact citation is usually given.

Contents: Preface. Introduction. 1. Fermented rice (incl. tape ketan [tapeh], sake, awamori). 2. Fermented soy beans: Soysauce (p. 173-294; 350 references), tempe (p. 294-307; 43 refs), natto (p. 307-312; 13 refs), miso (p. 312-343; 100 refs). 3. Fermented coconut press cake (bongkreng; p. 345-47). 4. Sauerkraut. 5. Fermented fish. 6. Vinegar. 7. Fermented cassava (tape / tapeh). Author index (p. 459-70).

Financial assistance was received from the National Institute of Chemistry, the Indonesian Institute of Sciences, the Indonesian Protein Project in the framework of ASEAN-Australian Economic Co-operation. Address: Indonesia.

774. Birnbaum, Alfred. 1978? Re: Yuki-wari natto. Letter to William Shurtleff at New-Age Foods Study Center, Lafayette, California, July 12. 1 p. Undated. Handwritten in pencil.

• **Summary:** "A nattō resembling miso, featuring the nebari [stickiness] of nattō and the sweetness of koji. A two-fermentation product.

"Process: Regular nattō is minced finely with koji, shoyu and (kombu) dashi and fermented at 30° to 33°C for 30-40 days."

Note: This top portion of page 2 of some letter from Alfred has been separated from the body of the letter; hence the lack of date and address.

775. Birnbaum, Alfred. 1979. Re: Comments on new condensed edition of *The Book of Tofu*. Letter to William Shurtleff at New-Age Foods Study Center, Jan. 26. 1 p. Handwritten (in pencil) and signed.

• **Summary:** He received the condensed version from Shurtleff and Aoyagi. "I think that the compact format should reach a large readership. Excellent work!"

"I particularly liked your having created a separate

section on 'Fermented Tofu,' and of course, I noticed your updating the sections on nattô, Daitokuji nattô & hamanattô. No doubt you did considerable revision.

"On rereading some parts of the original edition for comparison I did have some questions (I am not sure if I had brought them up with you or not):

"P. 312, unabridged. 4 Chinese characters (Cc). You have read as 'Nishiyama Sodo,' though when I went there I was told it was called 'Saizan Sodo.' (Incidentally it was there that I had what I consider probably the finest tofu dinner I can remember).

pp. 309, 312, unabridged; p. 385 revised = 4 Cc. I have always heard this read as 'Fusa Ryôri,' not 'Fucha,' though perhaps the case is the same as with 2 Cc, which can alternatively be read 'sado' or 'chado' [the way of tea]. Note: Major Japanese dictionaries and glossaries all say *fucha ryôri*.

"Incidentally, have you seen the new Shufu-no-tomo English translation out on *Shojin Cooking* (\$7.95)?"

776. Ishima, Toshio; Ohta, Teruo. 1979. Nattô seizô kôtei ni okeru hakkô kôtei no kôtei kaiseki [Statistical analysis of fermentation process in natto making]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 34. p. 258-65. Jan. [1 ref. Jap; eng]

• **Summary:** The best induction time was 2-3 hours for optimal natto viscosity and hardness. A faster rate of temperature increase improved the appearance and color of natto, but caused a deterioration in viscosity. The longer the temperature of the natto beans remained over 50°C, the greater the viscosity. Glutamic acid polymer formation reaction continues at this temperature. From multiple regression analysis, taste, appearance, and viscosity were the most important sensory characteristics, in that order.

Reprinted from *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)*. No. 1. p. 5-11 (1977). Address: National Food Research Inst., MAFF, Tokyo, Japan.

777. Shurtleff, William; Aoyagi, Akiko. 1979. The book of tofu: Food for mankind. Condensed and revised. New York, NY: Ballantine Books. xii + 433 p. Jan. Illust. by Akiko Aoyagi Shurtleff. Index. 18 cm. [60 ref]

• **Summary:** This book has been extensively revised and updated. Many names of Japanese tofu have been Americanized. Contents: Preface. Acknowledgements. 1. Protein East and West. 2. Tofu as a food. 3. Getting started: Favorite tofu recipes. 4. Soybeans. 5. Fresh soy puree. 6. Okara (Soy pulp). 7. Curds and whey. 8. Tofu & firm tofu. 9. Deep-fried tofu: Tofu cutlets, burgers, treasure balls, and pouches. 10. Soymilk. 11. Silken tofu. 12. Grilled tofu. 13. Frozen & dried-frozen tofu. 14. Fermented tofu. 15. Yuba. Appendices: A. Tofu restaurants in Japan. B. Tofu shops and soy dairies in the West. C. Varieties of tofu in East Asia. D. Table of equivalents. Bibliography. Glossary. Contains 250

recipes and 100 illustrations. Price: \$2.95.

This new edition features: (1) New recipes: Over fifty new American-style tofu recipes including Creamy Tofu Dressings, Tofu Teriyaki, Tofu Burgers, Tofu Eggless Egg Salad, and the like. The key to the book is an updated list of favorite tofu recipes plus suggestions for incorporating them into a weekly menu (p. 56). (2) New sections: An extensive new introduction to Soy Protein Foods (p. 66), dairylike products made from tofu (p. 150), dairylike products made from soymilk (p. 302) including soymilk yogurt (fermented), ice cream, kefir, mayonnaise, whipped cream, popsicles, buttermilk, and soy shakes. (3) New chapters: Fermented Tofu and Varieties of Tofu in East Asia. (4) New basic methodologies: The key recipes for homemade tofu and homemade soymilk have been simplified and improved. (5) Updates: A complete listing of the 120 tofu shops and soy dairies now operating in the West; over 60 Caucasian-run shops have opened in the past two years. (6) New Americanized tofu names: Including tofu burgers, tofu cutlets, silken tofu, wine fermented tofu, and fresh soy puree. (7) No sugar.

Page 110: "In Japan, tofu is also called *momen-goshi* ('cotton-filtered') to distinguish it from its popular counterpart *kinu-goshi* ('silken tofu')." Note 1. This is the earliest English-language document seen (March 2004) that uses the term "silken tofu."

Note 2. This is the 2nd earliest English-language document seen (Oct. 2011) that contains the term "Wine-fermented tofu" (p. 361).

In Jan. 1988 a new printing (but not a new edition) of this book (the 13th), slightly revised, appeared. It had a new cover and many new small illustrations. The subtitle was "Protein Source of the Future—Now!" The heading: "The World's Bestselling Book on Tofu." Address: New-Age Foods Study Center, P.O. Box 234, Lafayette, California 94549.

778. Shurtleff, William. 1979. Protein source for the future. *Cosmos (NSW, Australia)* 6(6):1, 4-5. Jan.

• **Summary:** Gives ten reasons why soybeans will be the protein source of the future: 1. Optimum land utilization. 2. Lowest cost protein. 3. High nutritional value. 4. Time tested. 5. Remarkably versatile. 6. Appropriate technology. 7. New dairylike products. 8. Hardy and adaptive. 9. Free nitrogen fertilizer. 10. Energy and resource efficient. "All of these ten factors work together synergistically, reinforcing one another, to give added weight to the prediction that soybeans will be a key protein source for the future on plant earth."

Note: This information was published in July 1979 in *The Book of Tempeh* (p. 21-24). Address: Lafayette, California.

779. Shurtleff, William; Aoyagi, Akiko. 1979. Soybeans (Document part). In: William Shurtleff and A. Aoyagi. 1979.

The Book of Tofu. New York: Ballantine Books. 433 p. See p. 58-75. Chap. 4.

• **Summary:** Contents: Introduction. Soy protein foods—Traditional non-fermented soyfoods: Whole dry soybeans, soynuts, roasted soybeans, fresh green soybeans, soy sprouts, natural soy flour and soy grits, roasted soy flour (kinako).

Traditional fermented soyfoods: Tempeh, miso, shoyu (Japanese natural soy sauce), natto (fermented whole soybeans, including Japan's cracked natto {*hikiwari natto*} and finger lickin' natto {*yukiwari natto*, containing rice koji and salt}, and thua-nao from northern Thailand), soy nuggets (inc. Japan's Hamanatto and Daitokujji natto).

Modern western soyfoods (developed using high-level technology): Soy flakes, defatted soy flour and grits, soy protein concentrates, soy protein isolates, spun soy proteins, textured soy proteins (TVP is an ADM brand name), textured soy concentrates, soy oil products. Address: P.O. Box 234, Lafayette, California 94549.

780. Suzuki, Tatsuro; Ohta, Teruo. 1979. Shihan nattô-kin no seishitsu ni kansuru kenkyû [Studies on the biological properties of commercial natto starters]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 34. p. 266-72. Jan. [7 ref. Jap; eng]

• **Summary:** The modern process of making natto uses a suspension of pure culture *Bacillus natto* spores as the starter culture. "The biological properties of four kinds of commercial natto starters which were" used for making natto in 1974 were investigated.

Eleven strains of natto bacteria separated from four commercial natto starters showed different characteristics on plate cultures. Seven strains were identified as *Bacillus natto* and four strains as *Bacillus licheniformis*. Of the later four strains, each contained two types of bacillus spores at the level of  $10^8$  per 1 ml or 1 gram.

The 7 strains of *Bacillus natto* showed differences between one another in "the strength of hydrolysis of starch or gelatin and the production of acetyl methyl carbinol."

Note: 3-Hydroxybutanone, also known as acetoin or acetyl methyl carbinol, is a colorless or pale yellow to green yellow liquid with a pleasant buttery odor (Source: Wikipedia, Oct. 2008). Address: National Food Research Inst., MAFF, Tokyo, Japan.

781. Taira, Harue; Taira, Hirokadzu; Yoshio, Mori; Ushirogi, Toshizo; Fujimori, I.; Kawasaki, Y.; Suzuki, N.; Koyatsu, H.; Takei, R. 1979. Daizu shushi no kansô shori hôhō to sono hinshitsu ni tsuite. III. Teisui-bun ganryô shushi no kansô shori ga shushi no butsurei-teki seijô oyobi kakô tekisei ni oyobosu eikyô to tôfu oyobi nattô no kôjô seizô shiken [Influence of dry treatment after harvest on quality of soybean seeds. III. Influence of low moisture seeds drying on the physical properties and suitability for food processing and factory production of tofu and natto]. *Shokuhin Sogo*

*Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 34. p. 19-28. Jan. [9 ref. Jap; eng] Address: National Food Research Inst., MAFF, Tokyo, Japan.

782. Wang, H.L.; Mustakas, G.C.; Wolf, W.J.; Wang, L.C.; Hesselstine, C.W.; Bagley, E.B. 1979. Soybeans as human food: Unprocessed and simply processed. *USDA Utilization Research Report* No. 5. iv + 54 p. Jan. Slightly revised, July 1979. Jan. No index. 28 cm. Compiled for USAID. [50+ ref]

• **Summary:** Contents: Introduction. 1. Soybean food uses in Asia. China: Soaking dry soybeans, tou chiang (soybean milk), tou fu (soybean curd), processed tou fu products, tou fu pi (protein-lipid films), huang tou ya (soybean sprouts), whole soybeans, fermented soybean foods, production and consumption. Japan: Tofu (soybean curd), kinugoshi tofu, processed tofu products, yuba (protein-lipid film), soybean milk, gô (ground soybean mash), daizu no moyashi (soybean sprouts), whole soybeans, fermented soybean food, production and consumption. Korea: Tubu (soybean curd), processed tubu product, soybean sprouts, whole soybeans, soybean flour, fermented soybean food, production and consumption. Indonesia: Tahu or tahoo (soybean curd), bubuk kedele (soybean powder), tempe kedele, tempe gembus [the name in Central and East Java for okara tempeh], oncom tahu [the name in West Java for okara onchom], other soybean products (soybean sprouts, green soybeans, roasted and boiled soybeans, kecap {soy sauce}, taucu {soybean paste}), food mixtures, production and consumption. Thailand: Tofu (*tauhu*), soy sauce, green soybeans in the pods (*tourae*). Philippines: Soybean sprouts, soybean coffee, soybean cake, soybean milk, tou fu and processed tou fu products, production and consumption. Burma. India. Malaysia. Nepal. Singapore. Sri Lanka (Ceylon). Vietnam. Middle East. References—Soybean food uses in Asia.

2. Soybean food uses in Africa. Ethiopia: Injera, wots and allichas, kitta, dabbo, dabokolo, porridge. Kenya. Morocco. Nigeria: Whole soybeans, soybean paste, corn-soy mixtures (soy-ogi). Tanzania. Uganda. Production. References—Soybean food uses in Africa.

3. Soybean food uses in Europe and U.S.S.R.

4. Soybean food uses in Latin America. Argentina. Bolivia. Brazil. Chile. Colombia. Ecuador. Guyana. Paraguay. Peru. Uruguay. Venezuela. Mexico: New village process, commercial developments. Honduras. Costa Rica. Panama. Dominican Republic. Jamaica. Haiti. Trinidad. References—Soybean food uses in Latin America.

5. Soybean food uses in North America. United States. Canada. References—Soybean food uses in North America.

6. Soybean food uses in Australia. 7. Summary of soybean food uses. Traditional soybean foods: Soybean milk, soybean curd and processed soybean curd products, protein-lipid film, soybean sprouts, tempe (tempeh), green soybeans,

boiled soybeans, roasted soybeans, soybean flour, soy sauce, fermented soybean paste, fermented whole soybeans, natto, fermented soybean curd. Experimental soybean foods: Whole soybean foods, soybean paste, soy flour, soy beverage. Production and consumption.

8. Simple village process for processing whole soybeans: Equipment, process, sanitation requirements, quality of product, evaluation of product in formulas and procedures for family and institutional use in developing countries. NRRC village process. 9. Industrial production and selling prices of edible soybean protein products.

10. Barriers to accepting and using soybeans in food: Availability. Cultural and social factors. Texture. Flavor. Nutrition and food safety. Technology development. Technology transfer. Address: NRRC, Peoria, Illinois.

783. *Toyo Shinpo (Soyfoods News)*, 1979. Nattô senka: Nattô no hozonshoku [Natto specialty products: Preservable types of natto]. March 21. p. 13. [Jap]

• **Summary:** Many recipes for making natto are given.

Note: Dr. Teruo Ohta says that the Tohoku region of Japan has the highest natto consumption at 200 gm per person per month. Next comes the island of Hokkaido and the Kanto region, each at 100-150 gm per person per month. In the Kansai (Kyoto–Osaka–Kobe) and Kyushu regions it is only about 50 gm per person per month. In 1968 there were about 1,600 commercial natto makers in Japan and they produced 80,000 tons of natto. In the old days, natto took 2-7 days to ferment.

784. Fukushima, D. 1979. Fermented vegetable (soybean) protein and related foods of Japan and China. *J. of the American Oil Chemists' Society* 56(3):357-62. March. [10 ref]

• **Summary:** Contents: Abstract. Introduction. Soy Sauce: Fermented soy sauce: Japanese and Chinese styles of soy sauce and their characteristics. Manufacturing process. Comparison of fermented soy sauce with chemical soy sauce. Fermented soy paste. Chinese soybean cheese (sufu). Fermented whole soybean (natto). New fermented soybean products.

Tables show: (1) Types of fermented soy sauce (shoyu) in Japan. The five types are koikuchi [regular shoyu] (85.4% of total; 1.050 million kiloliters a year), usukuchi [light-colored shoyu] (11.1%), tamari shoyu (2.2%), shiro [clear shoyu] (0.4%), and saishikomi [twice-fermented shoyu] (0.3%).

(2) Consumption of whole soybeans and defatted soybeans in Japan, 1976 (one-third is for foods, especially shoyu, and two thirds is for feed).

(3) Typical composition of soy sauces recognized by the Japanese government. The five types are the same as those discussed in Table 1.

(4) Annual production of soy sauce by grade, as graded

by the Japanese Agricultural Standard (JAS) in 1976. The 3 grades are special (53.4% of total), upper (26.0%), standard (12.9%), non-JAS mark (7.7%). Total production is 1.226 million kiloliters.

(5) Chemical composition of major types of miso in Japan. The five types are rice miso (sweet, semisweet, and salty), barley miso (semisweet), and soybean miso (salty). For each is given the color, aging time, chemical composition, and total tonnage produced.

Figures show: (1) Flow sheet for making koikuchi (regular) shoyu. (2) Flow sheet for making tamari (regular) shoyu.

(3) Two chromatograms comparing the organic acids of fermented and chemical (HVP) soy sauce. Fermented soy sauce has an abundance of lactic acid, whereas HVP soy sauce has an abundance of formic acid.

(4) Flow sheet for making rice miso. (5) Flow sheet for making sufu [fermented tofu]. (6) Flow sheet for making natto. (7) Flow sheet for making fermented soy milk drink.

Concerning fermented whole soybean (natto): It is a traditional fermented food that originated in the “northern parts of Japan 1,000 years ago.” It is usually served with shoyu and mustard.

A portrait photo shows Danji Fukushima. Address: Kikkoman Foods, Inc., P.O. Box 69, Walworth, Wisconsin.

785. Sakaguchi, Y. 1979. Opening remarks—Vegetable proteins in fermented foods and other products. *J. of the American Oil Chemists' Society* 56(3):356. March.

• **Summary:** “Miso, or soybean paste, one of the most important fermented soybean foods, was originally made in China. A missionary who was sent [from Japan] to China learned its production and modified it into a product suited to the Japanese taste in the 7th century. About 185,000 tons of soybeans are used for miso production annually.

“Another major fermented soybean food is soy sauce which was originally developed by the Zen Monk Kakushin in 1234. He also visited China and discovered that the liquid portion from Miso was very delicious. This liquid became the base for soy sauce, an essential ingredient in the Japanese diet. Soy sauce required the annual use of nearly 175,000 tons of soybean meal, the equivalent of 222,000 tons of soybeans.

“Natto, the third major fermented soybean product of Japan, originated in our country. In 1087, a ruler in the northern part of Japan discovered natto to be part of local farmers' diets. Today, nearly 60,000 tons of soybeans are consumed in its production.

“As Japan continues to draw from its historic past for a source of soy-based foods, we also are full participants in the new era of sophisticated vegetable protein foods. To promote utilization and production of this product, the Japan Vegetable Protein Food Association was organized in 1975.”

A photo shows Dr. Yukio Sakaguchi. Address: Japan

Vegetable Protein Food Assoc., 9th Floor, Rainbow Building, 2-15-17 Nishi-Shinbashi, Minato-ku, Tokyo, Japan.

786. Watanabe, Tokuji. 1979. Developments in the processing of traditional soybean foods in Japan. In: Hideo Chiba, et al., eds. 1979. Proceedings of the Fifth International Congress of Food Science and Technology (1978-Kyoto). Tokyo: Kodansha Ltd.; Amsterdam and New York: Elsevier Scientific Publishing Co. xi + 436 p. See Chapter 2.1, p. 66-73. Illust. Author index. Subject index. 26 cm. Series: Developments in Food Science, Vol. 2. [9 ref]  
 • **Summary:** Chapter 2, titled "Efficient utilization of food resources," has three parts, of which this is the first. Contents: Introduction. Tofu (incl. "packed tofu" using GDL as a coagulant). Kori-tofu. Miso. Soy sauce (shoyu). Natto. Conclusion. A figure shows five flow-sheets, one for making each of the different foods mentioned above.

The importance of soybeans as a food ingredient in Japan is evident from the fact that nearly 1 million metric tons of soybeans, including those used after oil extraction, are consumed each year to make tofu, kori-tofu, natto, miso, soy sauce, and other foods. "The development of automated equipment for continuous processing has made mass production of these foods possible, ensuring evenness of quality and lowness of price, to the benefit of consumers." Address: Kyoritsu Women's Univ., 2-2-1 Hitotsubashi, Chiyoda-ku, Tokyo 101, Japan.

787. Hesseltine, Clifford W.; Wang, Hwa L. 1979. Fermented foods. *Chemistry and Industry (London)* No. 12. p. 393-99. June 16. [4 ref]

• **Summary:** Contents: Fermentation: Advantages of fermented foods. Need for more research. Need for a worldwide fermented foods catalogue. Investigating the process. Characteristics and microorganisms. Fermentation: 12 aspects that merit attention. Improvement: Example of tempeh spores and plastic bags. New foods (such as wheat and cereal tempehs). Future of traditional fermented foods (it looks bright). Mahewu. Kaffir / Bantu beer.

"Finally we would like to suggest several fermented foods that might be possible candidates for future development outside the Orient. These are miso, natto, hamanatto, and sufu." Address: NRRC, Peoria, Illinois.

788. Shurtleff, William. 1979. Sources of vegetarian vitamin B-12. *Vegetarian Times* No. 31. May/June. p. 36-37, 39-40. Reprinted, revised and updated, in *Vegetarian Times*, Feb. 1983, p. 61-63. [11 ref]

• **Summary:** This review of the literature shows that the major vegetarian sources of vitamin B-12 are fermented soyfoods (tempeh, natto, miso), single-cell-proteins (spirulina, chlorella, scenedesmus, unfortified yeasts), sea vegetables (kombu, wakame, and others). The richest known animal source is beef liver. Address: New-Age Foods Study

Center, P.O. Box 234, Lafayette, California 94549.

789. Shurtleff, William. 1979. Re: Interest in your work with amazake, natto, and mochi. Letter to Charlie Kendall in Massachusetts, Aug. 4. 1 p. Typed, without signature (carbon copy).

• **Summary:** "Dear Charlie; Patti Smith recently told me of your work with amazake, natto, mochi, and sauerkraut. I am presently writing a book entitled *Soyfoods* and would be most interested to learn more about what you are doing with natto. How do you make it? How do you recommend that people serve it? Do you find that many Americans like it? I do, but I have found many Americans that don't. Is there a recipe that overcomes this resistance? I'd like to include mention of your work in our forthcoming book.

"I have done a lot of research on natto in Japan; you will notice that we have a slide set described in the enclosed catalog.

"I look forward to hearing from you in answer to these questions." Address: New-Age Foods Study Center, P.O. Box 234, Lafayette, California 94549.

790. Esko, Wendy. 1979. Introducing macrobiotic cooking. Tokyo: Japan Publications. 144 p. Foreword by Aveline Kushi. Preface by Edward Esko (both written June 1978). Illust. by Bonnie Harris. Index. 26 cm. Reprinted in 2006 by Square One Publishers (Long Island, NY, 240 p.).

• **Summary:** The author was introduced to macrobiotics in upstate New York in about 1971. This is her first book on macrobiotics. It was originally published under the title of *An Introduction to Macrobiotic Cooking* by the East West Foundation, 17 Station Street, Brookline, Massachusetts 02146. Though copyrighted in 1978, the first edition appeared in Sept. 1979. The fourth printing was May 1981.

The chapter titled "Beans including tofu and natto" gives descriptions of and recipes for making: Japanese black beans (black soybeans, p. 54; "These beans are therapeutic for the sexual organs and will relieve an overly yang condition caused by too much animal food or fish.") Soybeans (p. 54. "These beans are the most yin of the bean family... It is recommended that soybeans be eaten only occasionally as a separate side dish. Because they are very yin, they should be cooked with yang vegetables such as lotus root or burdock, for balance. The best way to eat soybeans is in the form of *tofu*, *okara*, *natto*, *tempeh*, and, of course, miso and tamari.") Tofu, and Homemade tofu (curded with nigari, p. 54-55). Okara (p. 55-56). Tofu and corn. Tofu, onions and water cress. Dried tofu (dried-frozen, p. 57). Yuba (dried soy milk; how to make at home). Vegetables and dried soy milk (p. 57). Ganmodoki (Tofu and jinenjo patties, p. 57-58). Natto (description and how to make at home, p. 58-59).

Other soy-related recipes include: Tofu soup (p. 68). Miso soup (p. 69-70, basic, or quick). Watercress miso soup (p. 71). Daikon and sweet rice dumpling soup (with miso).

Chinese cabbage and tofu miso soup (p. 71). Aveline Kushi's miso stuffed lotus root (p. 86). Tofu dressing (p. 91). Miso-tahini spread (p. 92). Miso-sesame spread (p. 92). Miso-lemon sauce (p. 93). Tofu dip (p. 93). Miso with scallions (p. 95). Tamari (description, p. 95). Tekka (made with Hatcho miso, p. 96). Miso pickles (p. 100-01). Tamari pickles (p. 101). Tofu plaster (p. 130). Ume-Sho-Kuzu drink (with umeboshi, tamari and kuzu, p. 131). Ume-sho-bancha (with tamari, p. 131). Use of tamari, miso, and tekka (p. 132).

Also includes instructions for making amasake at home (p. 116; it is a natural sweetener made from fermented sweet rice), and a recipe for Amasake bread (p. 107), instructions for making seitan at home (p. 46-47, using 3½ lb of hard spring or hard winter whole wheat flour; spring wheat flour produces a much softer texture of seitan than the winter variety), and recipes for seitan stew, seitan-barley soup, sauteed vegetables and seitan, stuffed cabbage with seitan, and seitan croquettes (p. 47-49), plus recipes for leftover seitan (p. 125). Address: East West Foundation, near Boston/Cambridge, Massachusetts.

791. Tanaka, Teruo. 1979. Restriction of plasmid-mediated transformation in *Bacillus subtilis* 168. *Molecular & General Genetics* 175(2):235-37. Sept. \*  
Address: Mitsubishi Kasei Inst. of Life Sciences, 11 Minamiooya, Machida, Tokyo, Japan.

792. Tanaka, Teruo. 1979. *recE4*-Independent recombination between homologous deoxyribonucleic acid segments of *Bacillus subtilis* plasmids. *J. of Bacteriology* 139(3):775-82. Sept. [18 ref]

• **Summary:** Note: As scientists move ever closer to the heart of matter, the descriptions of what they observe, and the words and terms they use, become increasingly incomprehensible to the lay reader. Yet this research is the cutting edge of science.

This is such an article, about plasmids, a particular region of the *Bacillus subtilis* chromosome, and how new plasmids are regenerated. Address: Lab. of Microbiological Chemistry, Mitsubishi Kasei Inst. of Life Sciences, Minamiooya 11, Machida-shi, Tokyo, Japan.

793. Ohta, Teruo; Takano, Kenji; Nikkuni, Ikumi; Hashizume, K.; Saio, K. 1979. Shokuhin-yô daizu no chôki hokan-chû no hinshitsu henka [Soybean quality change and its influence on food processing]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 35. p. 56-70. Oct. [6 ref. Jap; eng]

• **Summary:** As soybeans were stored for 1 year, the changes in their quality were measured and the effects of these changes on natto, tofu, and aburage were investigated under different temperatures (15, 25, and 35°C) and humidity (RH = Relative Humidity 60, 70, and 80%). New crop (recently harvested) soybeans grown in the USA and China were used

in this experiment.

Soybean quality deteriorated with time, and there were definite measurable changes in the ability to germinate / sprout, acid values, titratable acidity, Nitrogen Solubility Index (NSI), solids extracted in soakwater, and extraction rates of protein and solids into soybean milk.

The passage of time in storage led to harder cooked beans for natto, lower yield of soybean milk and tofu, lower coagulation rate in tofu, and less ability to expand during deep frying in aburage.

Increased temperatures and relative humidity increased the rate of soybean quality deterioration as measured above, and increased RH caused more deterioration than the increased temperature. Therefore, soybeans awaiting processing into natto, tofu, or aburage should be stored in a cool, dry place. Address: National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan.

794. Taira, Harue; Taira, Hirokadzu; Mori, Y.; Ushirogi, T.; Fujimori, I. 1979. Daizu shushi no kansô shori hôhô to sono hinshitsu ni tsuite. IV. [Influence of dry treatment after harvest on quality of soybean seeds. IV. Suitability for food processing of stored seeds]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 35. p. 160-71. Oct. [11 ref. Jap; eng]

• **Summary:** The effects of dry treatment (drying) after harvest on the physical properties, chemical composition, and suitability for food processing of soybean seeds were investigated. The heat treatments were natural drying and air drying using heated and non-heated air at 20, 30, and 40°C.

The seeds were then stored at 15°C with RH (Relative Humidity) of 65% and 75%, at 30°C with RH of 65% and 75%, and at room temperature and humidity in a paper bag for 30, 60, 120, 180, 270, and 360 days, respectively. These various storage conditions were further investigated for their effects on suitability for food processing.

At a given RH, the seed moisture rose as the temperature rose; many figures are given. Seed quality degenerated as storage time increased. The following decreased: absorbability of water in seeds, rate of germination, extractability of protein from soaked seeds by hot water, pH of soybean milk, and ratio of weight of steamed seeds to raw seeds. And the following increased: soluble matter and protein in soak water, moisture content, hardness and darkness of color of steamed seeds.

Conclusion: Soybeans should be stored in a cool, dry place, ideally at a temperature of 15°C (50°F) or below and an RN of 75% or below. Remarkable deterioration was observed at 30°C with RH of 75%. Seeds heat dried at 40°C showed a significant decrease in suitability for making miso, natto, or cooked soybeans. Tofu making was less affected by drying the seeds with heated air.

Reprinted from *Proceedings of the Crop Science Society*

- of Japan (*Nippon Sakumotsu Gakkai Kiji*) 48(2):291-302 (1979). Address: 1-2. National Food Research Inst., Ministry of Agriculture, Forestry and Fisheries (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 3-4. Hokkaido Prefectural Central Agric. Exp. Station, Naganuma, Hokkaido 069-13.
795. Ko, Tokubo. 1979. Kankoku no hakkô shokuhin [Korean fermented foods]. *Hakko to Kogyo (Fermentation and Industry)* 37(3):202-11. [75\* ref. Jap]
- **Summary:** Shoyu and varieties of miso: 1. Historical background: The major foods used in Korea that contain soy are soy sauce (kan jang), soybean miso (doen jang), and red-pepper miso (kochu jang). Also there are jonkutsu jang, tamusu jang (makujang) and jupu jang. The suffix jang is the same as the Chinese chiang and the Japanese hishio, meaning mash. The origins of the varieties of shoyu and miso are not clear. But there was a character, tojang, in “Ronko” which was written by Oju? of the Gokan period. Also, there are some references to jang in the Analects of Confucius (Lun yu; Jap. Rongo). They indicate that jang existed years before Christ. In the “Kaitoyakushi?” there is a quotation from “Shintosho?” (618-907) that “shi” (fermented black soybeans or misodama) was a well known product of Bokkai (north of the Yellow Sea) in those days (Sakueki). It is thought that jang first appeared in Manchuria (Manshu was called Kokuri in those days) where soybeans were originally grown. Soybeans later spread to China and Japan.
- In Korea the oldest record of any variety of jang was found in *Sangokushiki* (683) as “shôshi?”. This indicates that people were already making shoyu and miso quite early on. In the *Ch'i-min yao-shu* (AD 530-550) a method of shi (or kaki) making was recorded. We guess that shi was the predecessor to today's meju (= misodama). The classic book *Kyukosetsuyo?* that was compiled in 1554 (Richo? period–Meisoo 9) is the oldest book that contains the techniques for making the Korean varieties of jang. About 8 different methods of production were recorded, amongst them the sink gan (chinjangho) and zojangho methods. In those days, meju (= misodama) was called misho. It is written that they steamed the soybeans, roasted and ground the wheat, then mixed the soy and the wheat in a 2:1 ratio. From this they made koji and dried it in the sun. That method was very similar to the koji-making method used in Japan. In Japan it was called kokori, hishio, or misho. Later, shoyu became known as jang? Miso became massho? and then returned to being called misho. Address: Presently: Tokyo Daigaku Biseibutsu Kenkyusho #3 Kenkyubu. Formerly: Seoul, South Korea. Tokoku Daigaku Shokuhin Kogakubu.
796. Kobayashi, S.; Honda, T.; Hayashi, U. 1979. Hydrolysis of food proteins by proteases of *B. natto*. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 3:21-29. [Eng]\*
797. Komatsuzaki, T.; Ohkuro, I.; Kuriyama, S.; Kawashima, M. 1979. [Lipolytic activity of natto bacilli in the presence of sugar or casein, and the influence of salt on this activity]. *Igaku to Seibutsugaku (Medicine and Biology)* 99:211-16. [Jap]\*
798. Komatsuzaki, T.; Ohkuro, I.; Kawashima, M.; Kuriyama, S. 1979. [Lipolytic activity of natto bacilli in the presence of sugar or casein, and the influence of salt on this activity]. *Igaku to Seibutsugaku (Medicine and Biology)* 101:219-22. [Jap]\*
799. Komatsuzaki, T.; Ohkuro, I.; Kawashima, M.; Kuriyama, S. 1979. [The difference in unspecifically immunizing effects among strains of natto bacilli]. *Igaku to Seibutsugaku (Medicine and Biology)* 99:343-45. [Jap]\*
800. Kubo, S.; Takagi, C.; Kedo, S.; Yamamoto, T.; Hayashi, U. 1979. [Studies on *Bacillus natto*. II. Continuous cultivation of *B. natto* on various agar media]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 3:57-66. [Jap]\*  
Address: Japan.
801. Sato, T.; Aoki, M.; Suzuki, S.; Numata, K.; Miyao, S. 1979. [On the shelf life of natto]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 3:13-20. [Jap]\*
802. Tanegashima, C.; Ishiyaki, Y. 1979. [Studies on the volatile flavor components of commercial natto]. *Mukogawa Joshi Daigaku Kiyô. Shokumotsu-hen (Bulletin of the Mukogawa Women's College, Food Science Series)* 27:37-38. (Chem. Abst. 96:141377. 1982). [Jap]\*
803. Tsurumaki, Y.; Sano, M.; Hayashi, U. 1979. [Proteases of natto]. *Natto Kagaku Kenkyu Kaishi (J. of the Natto Research Society)* 3:67-72. (Chem. Abst. 93:44103k). [Jap]\*  
Address: Japan.
804. Aihara, Cornelia. 1979. The calendar cookbook. George Ohsawa Macrobiotic Foundation, 1544 Oak St., Oroville, CA 95965. 253 p. [unnumbered]. Illust. by Nan Schleiger. Index. 17 x 24 cm.
- **Summary:** This macrobiotic cookbook is designed for cooking with the seasons. Breakfast and dinner menus are given for every day of the year. A glossary gives brief descriptions of the Japanese foods listed in the recipes. For example: “Tamari: traditional soy sauce (*shoyu*) made without chemicals. Tofu: curdled soy milk. Tekka: condiment of miso and vegetables cooked a long time.” All recipes are numbered.
- Soy-related recipes include: 2d. Baked mochi with kinako. 4. Kombu, age, albi nishime. 5. Black bean nishime

[these are almost certainly black soybeans]. 8. Amasake. 8a. Amasake kanten. 13. Natto with pickled daikon leaves. 18. Vegetable miso soup. 20. Mackerel with ginger miso. 28. Wakame miso soup. 32. Kidney beans with miso. 35. Onion miso. 46. Burdock, carrot and lotus root with oily miso. 60. Vegetable oden (with stuffed age). 63. Collard greens with age nitsuke. 64. Home-made age (deep-fried tofu). 73. Home made natto I and II. 75. Northern white beans with miso. 80. Home made tofu and nigari. 80a. Clear soup with tofu and shingiku [sic, *shungiku* = chrysanthemum leaves]. 80b. Tofu-scallion miso soup. 82. Amasake cake with cream cheese frosting (3-layer, using 1 lb of dairy cream cheese). 87. Wheat gluten (made from 10 cups whole wheat flour and 4 cups unbleached white flour). 87a. Seitan (with wheat gluten and tamari soy sauce). 87b. Fresh wheat fu (with wheat gluten). 87c. Boiled fu. 87d. Fried fu (Gluten cutlet). 87e. Cutlet kabobs (with cooked wheat gluten). 97. Scallion miso. 100. Okara nitsuke (okara is “soybeans which are leftover after making tofu”). 132. Amasake cake. 135. Amasake yeasted doughnuts. 138. Vegetable kabobs with lemon miso sauce. 159. Koi-koku (carp soup with barley miso). 161. Amasake cake with fruit and nuts. 177. Buckwheat dumpling miso soup. 183. Cooked vegetable salad miso ai (miso dressing). 191b. Tomato sauce with miso. Amasake cookies. 197. Onion cream miso soup. 199. Soybean soup. 220. Tofu, snow peas and white rice miso soup. 229. Cucumber with miso. 233. Fresh corn tortillas with scallion and oily miso. 236. Toasted rice balls with soy sauce or miso. 244. Barley miso soup. 245. Tekka [miso]. 251. Pan-fried eggplant with lemon-miso sauce. 257. Green pepper with sauteed miso. 259. Tofu with mustard sauce. 261. Goma tofu (made from sesame butter and a little tamari soy sauce). 263a. Parsley miso pickles. 263b. Miso pickles. 266. Amasake wedding cake. 274. Shingiku miso soup. 290. Tofu with kuzu sauce. 294. Soybean nitsuke. 304. Kombu, dried tofu, age nitsuke. 305a. Millet and soybean soup. 329. Amasake crescent cookies. 333. Tofu-egg clear soup with watercress.

The Acknowledgments section begins: “After the French Meadows Summer Camp sponsored by the George Ohsawa Macrobiotic Foundation in 1972, I looked over the menus of the meals I served at camp. In revising them, I had the idea to keep a one-year record of menus. I thought this would be a practical, everyday help for those people beginning to cook...

“Since then, seven years passed.” Address: Oroville, California.

805. Aoki, Hiroshi; Ito, Kiyoe. 1979. *Chôri to daizu* [Cooking and soybeans]. Gakken Shoin K.K., Tokyo. 173 p. Illust. Index. 22 cm. [151 ref. Jap]

• **Summary:** Contents. I. Cooking and soybeans. II. Soybean molecules and soybean protein. III. Cooking and traditional soy protein foods. 1. Cooked whole soybeans (nimame), green vegetable soybeans (yude-mame, edamame), soy sprouts. 2. Roasted soy flour (kinako). 3. Tofu. 4. Deep-fried

tofu pouches and tofu burgers (aburaage and ganmodoki). 5. Dried frozen tofu (kori-dofu). 6. Yuba. 7. Natto. 8. Tempeh. 9. Soymilk. 10. Miso (Miso soup, miso-ni, ae-mono). 11. Shoyu. IV. Cooking and new soy protein products. Address: 1. Prof., Otsuma Joshi Daigaku; 2. Prof., Tokyo Gaku Gei Dai.

806. Ko Swan Djien; Hesseltine, C.W. 1979. Tempe and related foods. *Economic Microbiology* 4:115-40. A.H. Rose, ed. Microbial Biomass. [65 ref]

• **Summary:** Contents: Introduction: Appearance and preparation, production, literature. Inoculum: Tempe mold, traditional inoculum, pure-culture inoculum. Production methods: Basic procedure, raw material, preparation of the soybeans, packaging, incubation and mould growth. Keeping qualities and preserving methods. Changes in chemical composition. Nutritive value. Other tempe-type processes: Tropical Products Institute process, oncom (ontjom), natto, thua-nao (based on Sundhagul et al. 1970), Tate and Lyle process.

“Meanwhile, in Indonesia, the attitude towards tempe has gradually changed over the last 15 years. Although most people like tempe, it was formerly considered as an inferior food, mainly because it is less expensive than other protein foods like meat, fish and eggs; another reason was that products of low quality were sometimes sold at the market. But, during the last decade through studies by universities as well as by government agencies, more attention has been paid to this product” (p. 119). Address: 1. Dep. of Food Science, Agricultural Univ., Wageningen, Netherlands; 2. NRRC, Peoria, Illinois.

807. Pederson, Carl Severin. 1979. *Microbiology of food fermentations*. 2nd ed. Westport, Connecticut: AVI Publishing Co. ix + 384 p. Illust. Index. 24 cm. [38 soy ref]

• **Summary:** Chapter 11, on “Nutritious fermented foods of the Orient” contains (p. 310-33): Introduction. Soy sauce. Natto. Koji, ragi, and similar inocula. Miso. Sufu or Chinese cheese. Monosodium glutamate. Aroz fermentado of Ecuador. Tempeh (“The term catsup originated from the Chinese ketsiap, a salty condiment prepared from fish” {p. 325-26}). Fish sauces. Taro. Address: Prof. Emeritus Cornell Univ. and New York State Agric. Exp. Station.

808. Takenaka, Haruko. comp. 1979. *Nihon kaseigaku bunken-shu 1969-1978* [Bibliography of home economics 1969-78]. Tokyo: Nihon Kasei Gakkai (Japan Home Economics Assoc.). 678 p. See p. 52-57. [275 ref. Jap]

• **Summary:** Bibliographies are given for soybeans (protein), soybeans (other nutrients), tofu, natto, other soyfoods, and azuki beans. Address: Nihon Joshi Daigaku, Kaseigaku-bu [Home Economics Dep., Japan Women’s Univ.].

809. Voldeng, Harvey D. 1979. *Soybeans in Canada—Past,*



present and future. Based on an article [sic, manuscript] by Dr. H. Voldeng. In: 1979. *Fats and Oils in Canada: Annual Review*. Ottawa, Ontario, Canada: Grain Marketing Office, Dept. of Industry, Trade and Commerce, Agriculture Canada. [vi] + 95 p. See p. 1-10. Chap. 1. [7 ref]

• **Summary:** Contents: Introduction. Introduction of soybeans to Canada. Importance of the soybean [worldwide]. Utilization. Food uses of soybeans: Oriental foods—Soy milk, tofu, sufu, miso, soy sauce, tempeh, Hamanatto, natto. Western ingredients—Full fat flour, defatted flour, soy protein concentrates (70% protein), soy protein isolate (more than 90% protein), textured soybean protein. Soybeans in Ontario. Development of short season varieties. Soybeans in Quebec and the Maritimes. Soybeans in the Prairies (southern Manitoba and Alberta).

A table shows soybean acreage in Ontario's leading counties in 1978. Kent 205,000. Essex 192,000. Lambton 170,000. Elgin 63,000. Middlesex 40,000. Other 7,000. Total (Ontario) 705,000 acres.

Soybeans grown in Ontario can be crushed at three plants: (1) Victory Soya Mills (owned by Procter and Gamble) in Toronto. (2) Canadian Vegetable Oil Processing Limited (owned by Canada Packers) in Hamilton. (3) The recently completed Maple Leaf Monarch plant (affiliated with Unilever Corporation) in Windsor. Total crushing capacity in Ontario is about 35 million bushels per year.

The CSP Foods Plant in Altona, Manitoba, has in some years crushed limited amounts of soybeans imported from the U.S.

“Development of short season varieties: The justification for the effort to develop a large acreage outside of southwestern Ontario has been the magnitude of imports of soybeans, meal and oil. This has been and continues to be sizeable. The situation (in metric tons = tonnes) is outlined below for the 1977/78 crop year: (1) Whole soybeans: Production 527,361. Imports 262,835. exports 64,173. Domestic crushing 728,400.

(2) Soybean oil: Imports 28,100. Exports 1,400. Domestic production 125,600.

(3) Soybean meal: Imports 376,300. Exports 45,600. Domestic production 575,400. Source: *Fats and Oils in Canada, Annual Review*, 1978.

Letter (e-mail) from Dr. H. Voldeng of Agriculture and Agri-Foods Canada. 2010. Feb. 16. The original “article” was not an article but a manuscript that was sent to the publishers of this volume; they reduced the length slightly. It was never published separately, no longer exists, and cannot be cited separately. Address: Agriculture Canada, Ottawa, Ontario.

810. Yamaguchi, Momoo; Kojima, Setsuko. eds. 1979. *Wa-Ei Nihon bunka jiten* [A cultural dictionary of Japan]. Tokyo: Japan Times. vii + 408 p. See p. 108. 19 cm. [Eng; jap]

• **Summary:** A very useful book with excellent definitions of

Japanese words in English. It is divided into nine parts; No. 2 is titled “dietary habits” (p. 79-131). Each definition has four parts: (1) The word is written in romanized English, with diacritical marks and a hyphen in compound words. (2) The word is written in characters. (3) A long definition is given in English. (4) Related words and “see also” words are given (romanized) and key words in the English definition are defined in Japanese (Chinese characters).

Words only distantly related to soy are preceded below by an asterisk. Soy-related words: abekawa-mochi (with “sweetened yellow soybean powder—kinako”), abura-age (fried soybean curd), aemono, age-dama, age-dashi (“soybean curd fried lightly without a tempura batter”), Ajino-moto (“a popular brand of monosodium glutamate”), ama-zake, \* an (sweet bean jam = azuki-an; Can be strained {*koshi-an*} or mashed {*tsubushi-an*}), dengaku-tofu, doburoku, eda-mame, fu (“dried, bread-like pieces of wheat gluten”), fucha-ryori (“Chinese-style vegetarian dishes served in some Japanese temples of Chinese origin”), ganmodoki, goma-ae, goma-shio (widely used with sekihan), hiya-yakko, inari-zushi, isobe-maki (with mochi, soy sauce and nori), kara-age, kashiwa-mochi (stuffed with sweet [azuki] bean paste), kina-ko (“yellowish soybean powder”), kishimen (seasoned with soy sauce and topped with a few pieces of fried bean curd), kitsune udon (seasoned with soy sauce and topped with a few pieces of fried bean curd), koji, koya-dofu, \* kuzu-manju (a ball of sweet redbean paste {azuki-an} with a covering of kuzu starch), kuzu-mochi (with kinako), masu (a small square measuring box, usually made of Japanese cypress {*hinoki*}). The three sizes measure 0.18, 0.9 and 1.8 liters. It is constructed by dovetailing, without the use of nails or adhesive. It is used for measuring soybeans, cereal grains, or for drinking saké), miso, miso-shiru, miso-zuke, \* mochi, nabe-mono (often contain tofu; examples are sukiyaki, yose-nabe, and mizu-taki), nama-gashi (traditional Japanese confections made with beans and/or glutinous rice, cooked but not baked), natto, \* nori (a dried sheet of laver, a seaweed), \* oboro (related to sushi, not soy), oden, \* ohagi (coated with sweet redbean paste {*azuki-an*}), shiru-mono (the two basic types are clear soup and miso soup), \* shiruko (sweet beanpaste soup with mochi; see zenzai), shojin-age, shojin-ryori, shoyu, suki-yaki, sukiyakinabe, suri-bachi, suriko-gi [suri-kogi], sushi, sushi-ya, teriyaki, tofu, \* ume-boshi (a Japanese pickled plum), wa-gashi (Japanese-style confectionery), wakame, warishita (soy sauce flavored seasoning), washoku = nihon-ryori, yaki-dofu, yaki-mono, yakko-dofu, yu-dofu, \* zenzai (“a thick kind of sweet redbean soup”).

Page 24 defines hiragana (lit. flat kana) as “The cursive form of *kana* script, one of the two sets of Japanese syllabary writing. *Hira-gana* is more commonly used than the other set called *kata-kana*. It is usually used for writing inflectional endings and function words not represented by Chinese characters (*kanji*).” Address: Tokyo, Japan.

811. *Manna Bulletin*. 1979-- . Serial/periodical. Meeuwenlaan 70, 1012 JK Amsterdam, Netherlands. Editor: Sjon Welters. Illust. 21 cm. [Dut]

• **Summary:** This is a magazine about natural foods, macrobiotics, and alternative lifestyles. Soyfoods Center owns Vol. 3, No. 2 (June 1979), and Vol. 4, No. 3 (autumn 1982). In the former issue, the advisors are Adelbert Nelissen and Willem de Ridder. The editors are Hans den Hoed, Wieke Nelissen, etc. The latter issue contains one article titled “Macrobiotic Economics and the Practice of Manna” (a photo shows Adelbert Nelissen, Manna director), and another titled “Fermented products, an essential supplement to a vegetarian (*plantaardig*) diet.” Page 12 shows an ad for Witte Wonder Products (2 Riemerstraat 186, 2513 EZ Den Haag), producers of tofu and seitan.

Talk with Sjon Welters. 1994. April 4. He was once the editor of this publication. He thinks it stopped being published in about 1984-1985. Address: Amsterdam, Netherlands.

812. UNI. 1980. 38 Mizos ill after eating soyabeans. *Times of India (The) (Bombay)*. Jan. 29. p. 21.

• **Summary:** Aizawal—“Thirty-eight people have been taken ill here since Friday after eating soyabeans, grown abundantly in Mizoram...” Of these, 27 have been admitted to the hospital.

Called *Bekang* locally, soyabean is a favourite dish of the Mizos, who boil the beans, then ferment them before eating.

Agricultural authorities suspect that these soyabeans may have been released from a seed stock treated with pesticides, then sold in the market.

Note 1. Mizoram it is one of the Seven Sister States in North Eastern India, located to the east of Bangladesh; Aizawal is the state capital. Mizoram is bounded on the east by Myanmar (Burma) and on the southwest by Bangladesh.

Note 2. This is the earliest document seen (Sept. 2010) concerning the cultivation of soybeans in Mizoram.

813. *Toyo Shinpo (Soyfoods News)*. 1980. Nattô no rûtsu wa Jawa? [Did natto originate in Java?]. March 1. [Jap]

814. *Toyo Shinpo (Soyfoods News)*. 1980. Nattô no rekishi: Shôhisha-sô no kakudai ga kyûmu. Kairyô kuwaeta howaito nattô [History of natto: There is an urgent need to expand the consumer market. Improved white natto]. March 1. p. 3. [Jap]

• **Summary:** A photo shows several packages of natto.

815. Daizu Kyokyu Antei Kyokai. 1980. Gaiyo [About the Japan Soybean Supply Stabilization Association]. Tokyo: DKAK. 12 p. March 31. 26 cm. [Jap]

• **Summary:** Name of organization with diacritics is: Daizu

Kyôkyû Antei Kyôkai. This association was founded on 26 Dec. 1974, following the U.S. soybean embargo in 1973. It has 8 member associations, including the Japanese national tofu, dried-frozen tofu, natto, miso, shoyu, oil, oil importer, and coarse grain associations. The name and address of each is given. Address: #2 Makoto Bldg. 5F, 1-4-4 Toranomon, Minato-ku, Tokyo 105, Japan. Phone: 03-591-3879.

816. Hase, Saki; Yasui, Takeshi; Nagashima, Shigeru; Ohta, Teruo. 1980. Daizu chozô-chû no hinshitsu henka ni tsuite: Tôrui oyobi denpun no dôkô [Change in quality of soybeans during storage: Change in sugars and starch content].

*Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 36. p. 7-13. March. [11 ref. Jap; eng]

• **Summary:** Soybeans imported from the United States (IOM = Indiana, Ohio, Michigan) and China, as well as two different kinds of soybeans grown in Japan for making natto were stored at different temperatures (15, 25 and 35°C) and relative humidities (RH) (60, 70 and 80%).

“Changes in the content of sugars and starches in these samples during storage were as follows: (1) All samples tested showed a similar pattern of change of sugars during storage.” (2) Under the conditions of 15°C and 60 or 70% RH, virtually no change in sugars was observed during storage for 12 months. (3) A greater change was found at 15°C and 80% RH than at 25°C and 60% RH. (4) An increase in raffinose content concomitant with a decrease in stachyose content was clearly observed at 25°C and 80% RH. (5) At the start of storage, the samples contained little low molecular weight sugars except pinitol, but the content of these sugars increased significantly during storage. These sugars included such sugar alcohols as sorbitol and galactitol. Glucose and galactose showed only a slight increase. (6) No change in starch content “was detected in these samples except for the one Japanese sample which showed a decrease during storage at 25°C and 35°C.” Address: 1-3, 4 National Food Research Inst.; 4. Okame Natto.

817. Taira, Harue; Taira, Hirokadzu; Kokubu, Yoshijiro; Otake, Shigeto. 1980. Shihan (Murasaki han?) byôkin ni yoru higai daizu no kakô tekisei [Suitability for food processing of purple specked soybean seeds caused by *Cercospora kikuchii*]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 36. p. 14-20. March. [7 ref. Jap; eng]

Address: National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan.

818. *Toyo Shinpo (Soyfoods News)*. 1980. Daizu no shinpi: Nattô yobina-kô, kosei o shimesu [The mystery of soybeans: Thoughts on the names of natto that express personalities or characteristics]. April 1. p. 3. [Jap]

• **Summary:** Contains a nice illustration of a “Zaru natto seller (*Zaru nattô uri*).”

819. Hesseltine, C.W.; Wang, H.L. 1980. The importance of traditional fermented foods. *BioScience* 30(6):402-04. June. [12 ref]

• **Summary:** Table 1 gives, for each food, the name, area or country, microorganism used, substrate, nature and uses. The following soy-related foods are included: Soy sauce (chiang-yu, shoyu, toyo, kanjang, kecap, see-ieu), miso (chiang, doenjang, soybean paste, tauco), Hamanatto (toushih, tao-si, tao-tjo [sic, tao-tjo = tauco is Indonesian-style miso]), sufu (fu-ru, fu-ju, tou-fu-ju, bean cake, Chinese cheese), tempeh, bongkrek, ontjom (oncom), natto. Address: NRRC, Peoria, Illinois.

820. *Toyo Shinpo (Soyfoods News)*. 1980. Shinseihin: “Mugi” “Genmai” Nattô. Daizu wa hitotsubumo haitte imasen [New products: “Barley” “Brown Rice” Natto. Not a single soybean is included]. July 1. [Jap]

• **Summary:** A photo shows the front of four new natto packages. These two types of natto are made using only cereal grains, without the use soybeans or any other beans. However the cereal grains are cooked in soybean cooking liquid; their natto-like strings come from this soybean liquid, which contains 0.17% protein. This is a good way of using leftover natto cooking liquid. The grains have no natto smell; with a light taste, they are good as part of a bread-based breakfast.

Note: There used to be a chlorella natto, but it was involved in a scandal and disappeared from the market. There was also kombu natto—a nice concept.

821. *Soyfoods*. 1980. Soyfoods to the American taste: An interview with Drs. Clifford Hesseltine and Hwa L. Wang. 1(3):58-62. Summer. [1 ref]

• **Summary:** Dr. Hesseltine just returned from a 6-week trip to East Asia. In Taiwan he studied soy sauce fermentation and gave advice on setting up a national collection of microorganisms used in soybean fermentations. In Indonesia he attended an international symposium on various aspects of fermentation as a method a processing foods, with an emphasis on soybeans in Southeast Asia. “These people look to us in the West as far as science is concerned. Suddenly we see scientific institutions in the U.S. and now in Europe being interested in high protein foods made from soybeans. The East Asians follow and say, ‘Well, if its very interesting for the West, then we should be interested in it.’” There is increasing interest in traditional, lightly-processed soyfoods.

Way back in 1963 the NRRL did research on making tempeh perforated plastic bags. Today, “on the island of Java, 90 percent of tempeh is now produced using plastic bags, including the tempeh I saw being sold on the street...”

Dr. Wang, who was born and raised in China, recently

returned there to visit family. She noted: “To me, it is a very sad story... Even tofu is rationed now. You can’t buy tofu every day, probably once a week.” “Soy sauce is not hard to get. Miso never had as much importance as in Japan... Tofu and soymilk are the two foods that were very common before. We stayed at a hotel and we only had soymilk once a week, in the morning for breakfast. And tofu, I don’t even remember having eaten any.”

“Dr. Hesseltine: Natto is one of the most rapidly growing fermented soyfoods in Japan, which surprised me, over something like miso. Natto has become more popular because it’s supposed to be the great aid for digestion. In the new form, natto is much more acceptable as a food because the old, traditional type is sticky (it’s a real mess) and this isn’t. This is coated, so what you get is like small peanuts coated with powder; they don’t stick to your hands.”

Dr. Hesseltine: “What I saw in Taiwan really fascinated me—pressed tofu sheets [*pai-yeh*]. “We would like to see the soycrafters making some recommendations [for us] as to practical areas of research for soybeans.”

Portrait photos show (1) Dr. Clifford Hesseltine. (2) Dr. H.L. Wang. Two photos of each, seated. Address: NRRC, Peoria, Illinois.

822. Bilasini Devi, S.; Jatishwar Singh, Kh.; Lakshmi Devi, Y.; Gyaneshwar Singh, W.; Singh, P.P. 1980. Assessment of nutritional status of Manipuri expectant mothers through selected hematological parameters. *Indian J. of Nutrition and Dietetics* 17(8):287-96. Aug. See p. 288. [18 ref]

• **Summary:** Clinical examinations, oral questionnaires and hematological parameters were used to determine the nutritional status of 99 pregnant Indian women of a distinct ethnic group. The area is primarily agricultural; food consumption patterns are based on rice, chillies, fermented foods (including fermented soyfoods), and fish. Anemia is less prevalent than in other areas of India, and blood iron levels are within normal limits, probably due to their diet. The key “features of their food habits can be summarised as (a) liking for fermented foods—fermented soya bean (*hawaijar*),...”

Note: This is the earliest document seen (Jan. 2012) that mentions “hawaijar” a fermented soyfood from Manipur and a close relative of Nepalese kinema and Japanese natto. Address: Departments of Biochemistry and Obstetrics and Gynaecology, Regional Medical College, Imphal [Manipur, India].

823. *Toyo Shinpo (Soyfoods News)*. 1980. Shokubunka kenkyûka Nagayama-shi, Nihon sôzô gakkai de kôen: Sekai ni rui o minai kansei sareta shokuhin nattô [Mr. Nagayama, a food culture researcher, lectured at a creative Japanese academic meeting: There is only one complete food like nattô in the world]. Sept. 11. [Jap]

• **Summary:** During the natto fermentation, vitamin B-2

increases fivefold. Natto sells best in the winter, whereas tofu sells best in the summer. A photo shows Mr. Nagayama standing in front of a blackboard, holding some papers.

824. Hesselstine, C.W.; Wang, Hwa L. 1980. Fermented foods. *Food Trade Review* 50(9):473-79. Sept.; 50(10):543-45. Oct. [4 ref]

• **Summary:** Discusses shoyu, tempeh, wheat soya tempeh, sufu, natto, koji, miso, ragi, and soy yogurt. Address: USDA NRRC, Peoria, Illinois.

825. Hodgson, Moira. 1980. Restaurants: Sushi and more and new Italian. *New York Times*. Oct. 10. p. C22.

• **Summary:** A review of Sushiko, a small Japanese restaurant in New York City between Broadway and Eighth Avenue, which has a “sushi bar.” Inexpensive side orders include: “Natto, mustard-colored fermented soybeans, gooey and unusual, were seasoned with mustard, chopped scallions and soy sauce, and had an extraordinary and subtle flavor, tasting slightly smoky, resembling food that has been cooked over charcoal. Bean curd came in large moist squares in a bowl of water, accompanied by a sauce of dried tuna [sic, bonito] flakes and scallions mixed with soy.”

Paper-thin yakinori (toasted nori) could be used as a wrap for natto. Spectacular nasu shigiyaki was an eggplant sliced in half, covered with miso sauce, and grilled. Misoshiru [miso soup] is a rich brown soybean soup. Tofu is added to a tossed American-style salad.

826. Noda, Kosaku; Igata, K.; Horikawa, Y.; Fujii, H. 1980. Synthesis of gamma-glutamyl peptides catalyzed by transamidase from *Bacillus natto*. *Agricultural and Biological Chemistry* 44(10):2419-23. Oct. [25 ref]

• **Summary:** It is well known that the sticky mucilage of natto is a mixture of polyglutamic acid (PGA) and fructan produced by *Bacillus natto*. Address: Lab. of Biochemistry and Lab. of Microbiology, Fukuoka Women’s Univ., Higashi-ku, Fukuoka 813, Japan.

827. Okunev, O.V.; Tikhonova, T.N. 1980. Elektroforeticheskoe razdelenie fragmentov DNK v agaroznom gele [Electrophoretic separation of DNA fragments in agarose gel]. *Molekuliarnaia Biologiia (Molecular Biology) (Kiev, USSR)* 26:23-26. Oct. [15 ref. Rus]

Address: Institut molekuliarnii biologii i genetiki AN USSR. (Institute of Molecular Biology and Genetics, Academy of Sciences, Ukrainian Soviet Socialist Republic).

828. Barber, Linda. 1980. Re: Thinking of writing a book about natto in English. Letter to William Shurtleff & Akiko Aoyagi at New-Age Foods Study Center, Nov. 7. 1 p. Handwritten (aerogram).

• **Summary:** Thank you for sending a copy of *Tofu and*

*Soymilk Production*. “I’m spinning from all the new information.”

“I wrote to you before about my work with tofu in Japan and now I’m beginning to study natto as well. Through my interest in tofu I met Hisao Nagayama (author of *Natto no Shimpì* and free lance writer about food culture). He wants to work with me, hopefully, to get a book about natto in English. I really feel honored but because of our language barrier, there are many problems. I remembered that the Center has many resources and, I hope, about natto! I don’t need the slides you advertized in your catalog, but any other information would be great! Could you let me know what is available and how much it would cost?”

“Thank you...”

Note 1. Linda and a Japanese author wrote a booklet (25 pages) in Japanese titled *Tôfu, Nattô Ryôri* [Tofu and Natto Cookery] which was published in Japan in 1981.

Note 2. Nishinomiya is a city located in Hyogo prefecture, Japan, between the cities of Osaka and Kobe. Address: c/o Kobe College, 4-1 Okadayama, Nishinomiya, 662 Japan.

829. Andoh, Elizabeth. 1980. At home with Japanese cooking. New York, NY: Alfred A. Knopf. 254 p. Illust. by Michiko Fujiwara. Index. 25 x 22 cm.

• **Summary:** A beautiful, intimate and very useful book, approachable and suffused with a unique tranquility and charm. The illustrations (line drawings) are exquisite.

Contents: Acknowledgments. Introduction. A note about the romanization of the Japanese language (Hepburn system). In the Japanese kitchen: Techniques and equipment—Grilling, broiling, steaming, braising and simmering, frying, dry roasting, grinding, crushing and mixing, using knives (four types, and how to hold and use them), skewering, straining and mashing, grating, pots and pans, miscellaneous equipment (chopsticks, rice paddle, rice tub, flat fan, bamboo mats, bamboo trays, metal mold, etc.). Meals and menu planning. The recipes: Soups, rice, noodles, braised and simmered foods, grilled and skillet-grilled foods, deep-fried foods, steamed foods, mixed, sauced and tossed foods, pickles, sweet things and beverages. In the Japanese kitchen: Foodstuffs. Suggestions for ordering Japanese foodstuffs, A glossary of Japanese terms.

The very helpful glossary includes (soy related): Abura agé: fried bean curd [tofu]. Aka miso: dark bean paste [miso]. Daizu: dried soybeans. Eda mamé: fresh soybeans. Kikkoman: brand name of soy sauce. Kinako: soy flour [roasted]. Marukomé miso: brand name of medium fermented bean paste. Miso: fermented bean paste. Miso shiru: soup thickened with fermented bean paste. Natto: fermented sticky soy beans. Okara: by-product of fresh tofu-making. Saikyô miso: light bean paste, a brand and regional name. Sendai miso: dark bean paste, a brand and a regional name. Shinshû Ichi miso: medium bean paste, a brand and

regional name. Shiro miso: white (or light) bean paste. Shōyu: soy sauce. Teri yaki: glaze grilling. Tōfu: bean curd. Usu kuchi shōyu: thin or light soy sauce. Yuba: thin brittle sheets of soy milk (by-product of tōfu-making).

Also includes: Each of the basic sea vegetables / sea greens used for food in Japan (ao nori, hijiki, konbu, nori, wakamé, etc.). Umé-boshi: pickled plums.

The book contains excellent recipes and descriptions (see the index) using bean curd [tofu] (7 recipes), eda mamé (1), fried bean curd (*abura agé*) (5), grilled bean curd (*yaki-dōfu*) (3), miso (17), and soybeans, dried (1); natto is not mentioned.

Elizabeth concludes the Introduction by explaining: “What I’ve tried to write here is the very book I wish I’d had with me when I started out fourteen years ago.”

About the author (last page and with portrait photo on inside rear dust jacket): Elizabeth, who was raised in New York and graduated from the University of Michigan, traveled to Japan in 1966 to study Japanese, lived with the Andoh family on the island of Shikoku, and married into that family two years later. Shortly after her marriage, she enrolled in a class at the Yanagihara School of Classical Japanese Cooking, where she studied for six years. She has a daughter, Rena, to whom this book is dedicated.

The copyright page states: “Many of the recipes which appear here were originally printed in slightly different form in *Gourmet* magazine, 1975, as part of a 6-part series entitled ‘The Seasonal Japanese Kitchen,’ by Elizabeth Andoh.” Address: Tokyo, Japan.

830. Esko, Edward; Esko, Wendy. 1980. *Macrobiotic cooking for everyone*. Tokyo: Japan Publications, Inc. 272 p. Nov. Foreword by William Tara, Director, Community Health Foundation, London, England. 26 cm. [50 ref]

• **Summary:** The authors studied in Japan (mostly Kyoto), from Sept. 1978 to May 1979, at which time they returned to Boston. In the summer of 1979 “more than 100 delegates from various regional centers throughout the United States and Canada met in Boston for the first North American Congress of Macrobiotics.” Part I of this book discusses the theory of macrobiotics and Part II gives recipes. Unfortunately, the book has no index, and the bibliography gives no years of publication. There are chapters on: Seitan, fu, and noodles (incl. soba), and Sea vegetables.

Soy-related recipes include: Brown rice and soybeans (p. 90). Miso soft rice (p. 96). Somen with deep-fried tofu (p. 118). Kenchin soup (with deep-fried tofu cubes and tamari, p. 130). Okara soup (p. 132). Miso soups (p. 137-143; 12 recipes are given plus a long letter from Jan Belleme, about how she and her husband, John, who arrived in Japan in late October 1979, are now living with the Onozaki family and studying miso-making there—p. 138-39). Sauteed cucumbers and miso (p. 154). Boiled cabbage, sweet corn, and tofu (p. 155). Udon-vegetable bane (with deep-fried tofu, p. 159).

Steamed kale and tofu (p. 161). How to make sprouts (incl. soybean sprouts, p. 177).

Chapter 5 is titled “Bean dishes, including tofu and natto.” It states (p. 178-79, without citing the source) that “In China and Japan there is a proverb, ‘A man who eats too many beans becomes a fool.’ ... Lima beans and soybeans are both very yin, and require thorough chewing. They should be eaten only on occasion and in small quantities... Kombu can be placed on the bottom of the pot when cooking chickpeas, soybeans, lima beans or kidney, pinto and navy beans. I have found that kombu definitely improves their flavor, and because of its high mineral content, creates a very balanced dish.” To pressure cook soybeans so that they do not clog the steam escape valve, first boil them for 30 minutes. Skim the foam off the top as it rises, and when no more foam rises to the surface you may place them in a pressure cooker and continue cooking until done. Recipes include: Japanese black beans (black soybeans). Soybeans with kombu and burdock. Soybeans with lotus root and salmon. Following a long discussion of tofu, Homemade tofu. Tofu with scallions. Tofu with bonito flake broth. Baked tofu with miso/lemon sauce. Broiled tofu. Tofu loaf. Steamed tofu rolls. Deep-fried tofu cakes. Aburage (Age or deep-fried tofu). Stuffed age pouches. Okara. Okara croquettes. Sauteed natto. Natto rice or noodles. Natto tempura. Dried natto.

Hijiki with soybeans (p. 193). Hijiki and deep-fried tofu (p. 194). Tempuraed tofu-nori rolls (p. 198). Koi-koku (Carp miso soup, p. 220). Daikon and tamari. Scallion miso. Green peppers and miso (p. 224). Miso condiments (p. 226). Tamari. Moromi (p. 227). Rutabaga-tamari pickles (p. 233). Quick miso pickles (p. 234). Tofu tamari dressing (p. 236). Tofu-sesame dressing. Shiro-miso-tofu dressing. Miso dressing (p. 237). Tamari-lemon dressing. Tamari-rice vinegar dressing. Miso-tahini dressing (p. 238). Miso-rice vinegar dressing. Miso walnut dressing. Miso-tahini spread. Sesame miso spread. Miso-nut spread (p. 239). Lentil-miso spread. Lima bean miso spread (p. 240). Tofu dip (p. 243). Amazake (p. 247-48). Clear broth soup with tofu & scallions (p. 253). The glossary lists many soy products plus azuki beans, sea vegetables (many types), gluten, koji, kuzu, mochi, natto, nigari, okara, seitan, tekka, tempeh, umeboshi, unohana (okara), and yuba.

Macrobiotic periodicals include: *East West Journal* (Brookline, Massachusetts). *Kushi Institute Study Guide and Kushi Inst. Newsletter* (Brookline, MA). *The Order of the Universe* (East West Foundation, Brookline, MA). *The Macrobiotic Review* (East West Foundation, Baltimore, Maryland). *Spiral* (Community Health Foundation, London). *Le Compas* (Paris). Note: The date each periodical began publication is not given.

The lengthy section on seitan (p. 110-13) gives a detailed recipe for making seitan at home using the short method and 3½ lb hard spring wheat flour or hard red winter wheat flour. The broth is made with kombu and tamari.

Seitan recipes include: Seitan stew. Seitan fried rice. Stuffed mushrooms (with sauce). Stuffed squash or Hokkaido pumpkin. Address: Boston, Massachusetts.

831. Somporn, Wannee. 1980. Review of solid substrate fermented products in Thailand. In: ASEAN Sub-Committee on Protein, ed. 1980. Report on the Second ASEAN Workshop on Solid Substrate Fermentation. Kuala Lumpur, Malaysia. 415 p. See p. 235-49. [3 ref]

• **Summary:** Table 3 shows fermented foods prepared in Thailand from legumes and cereals. Fermented foods having soybeans as the main substrate are: See iew (a condiment, made in central and south Thailand using bacteria, molds, and yeasts). Thua nao (main dish, made in north Thailand using bacteria). Tao hoo (tofu, main dish, made in central and south Thailand using bacteria, molds, and yeasts). Tao jiao (flavoring, made in central and south Thailand using bacteria, molds, and yeasts). Tao si ([fermented black soybeans], flavoring agent, made in south Thailand, using molds).

A survey of all soy sauce factories in Thailand was conducted in 1975. Representative samples were analyzed for both pathogenic organisms and aflatoxin, but neither was found (Biological Science Division, 1975-1976).

Note 1. This is the earliest English-language document seen (Feb. 2004) that uses the word “Tao hoo” (or “Tao-hoo”) to refer to tofu.

Note 2. This is the earliest English-language document seen (Jan. 2012) that uses the term “Thua nao” (with no hyphen) to refer to Thua-nao. Address: Biological Science Div., Dep. of Science Service, Ministry of Science, Technology and Energy, Thailand.

832. Sheraton, Mimi. 1980. Restaurants: Sushi and East Side Italian. *New York Times*. Dec. 26. p. C26.

• **Summary:** This is a review of Takezushi, a Japanese sushi restaurant with two branches in New York City: 11 East 48th St. and 101 West 45th St., at the Avenue of the Americas. Three basic types of sushi are offered: nigiri sushi, nori sushi, and chirashi sushi. Takezushi offers an earthy miso soup. “The 45th Street branch offers a few additional specialties that must be requested—natto, a mix of fermented soy beans, egg yolk and scallions;...”

833. Bau, H.M.; Debry, G. 1980. L’art de l’utilisation du soja: Habitudes et traditions [The art of soya utilization: Customs and traditions]. *Cahiers de Nutrition et de Dietetique* 15(4):277-84. Oct/Dec. [40 ref. Fre; eng]

• **Summary:** “For many centuries, soybeans have meant meat, milk, cheese, bread, and oil to the people of Asia. Because of their great food value, they not only have long had a definite place in the oriental diet but now belong in the diet of America and of the entire world. In Europe, the use of soybean products in the quotidian diet is still limited, however it is sure that they will be an important factor in the

balanced diet of the future.”

Note 1. Soyfoods Center has a 16-page English-language translation of this article.

Note 2. *Webster’s Dictionary* defines quotidian (derived from the French *quot* = as many as + *dies* = day) as “occurring every day.” Address: University of Nancy, France.

834. Campbell-Platt, Geoffrey. 1980. African locust bean (*Parkia* species) and its West African fermented food product dawadawa. *Ecology of Food and Nutrition* 9:123-32. \*

835. Fukakura, Noriko; Asano, M.; Murata, K. 1980. Daizu hakkô shokuhin no shikô-sei ni kansuru kenkyû [Survey on the acceptability of tempeh]. *Bulletin of Teikoku Gakuen* No. 6. p. 33-39. [8 ref. Jap; eng]

• **Summary:** A survey on the acceptability of tempeh was carried out by 50 members of a taste panel at the authors’ school in Osaka, Japan. “The results of the survey indicated that the appearance of tempeh was lower than that for flavor, taste, stickiness, and texture. More than 76% of the panel members favored tempeh over natto (the result may be different if a survey is carried in Kanto district). Among methods of cooking tempeh, deep fat frying was most favored. Salt was evaluated as the best seasoning for tempeh rather than coriander or curry. The panel also compared the meat burger, the meat with soyprotein burger, and the tempeh burger. The meat only was given the highest rating, the meat with soybean protein second, the tempeh burger was the lowest. However, it was found that the tempeh burger could be acceptable.” Address: Teikoku Women’s Univ., 173, 6-chome, Todacho, Moriguchi-shi, Osaka, Japan.

836. **Product Name:** [Morning Star {Venus} Natto].

**Foreign Name:** Myôjô Nattô.

**Manufacturer’s Name:** Kabushikigaisha Myôjô Shokumotsu Kenkyûsho (Marketer-Distributor). Made by Kabushikigaisha Teito Shokuhin.

**Manufacturer’s Address:** 5-7-22 Kugayama, Suginami-ku, Tokyo-to, Japan. Marketer address: 4-14-26 Musatsu?, Mitaka-shi, Tokyo-to, Japan. Phone: 0422-49-3151 (Marketer)..

**Date of Introduction:** 1980.

**Ingredients:** [Not listed].

**Wt/Vol., Packaging, Price:** 85 gm. Retails for ¥40 in Tokyo.

**How Stored:** Refrigerated.

**New Product–Documentation:** Product with Label purchased in about 1980 in Kichijoji, Tokyo. White on red, and red on white. Surprisingly no ingredients are listed, but the ingredients are probably water, soybeans, and natto culture (*Bacillus subtilis*). The front panel reads: Across the top, 6 medium-size white characters: Living natural food (*Ikita shizen shokuhin*). In lower right, many small white



characters: Name of marketing company.

Across the top, upside down, in small red letters on white:

This product is made by using the most vital nattô bacteria which was added to the highest class domestic soybeans, for the best among natto products.

The nattô's strong bacteria controls the bad bacteria in your body to make your stomach pleasant.

No additives are used.

837. Kawashima, M.; Kuriyama, S.; Komatsuzaki, T.; Ohkuro, I. 1980. [Influence of continued cultivation on various properties of natto bacilli]. *Igaku to Seibutsugaku (Medicine and Biology)* 101:287-91. [Jap]\*

838. Komatsuzaki, T.; Ohkuro, I.; Kawashima, M.; Kuriyama, S. 1980. [The difference in influence of capillary permeability caused by acetic acid among strains of natto bacilli]. *Igaku to Seibutsugaku (Medicine and Biology)* 101:113-16. [Jap]\*

839. **Product Name:** [Hikiwari Natto].

**Foreign Name:** Hikiwari Nattô.

**Manufacturer's Name:** Made for Seibu Stoaa by Satô

Shokuhin Kôjô.

**Manufacturer's Address:** Japan.

**Date of Introduction:** 1980.

**Ingredients:** Soybeans.

**Wt/Vol., Packaging, Price:** 85 gm. Retail for ¥40 in Tokyo.

**How Stored:** Refrigerated.

**New Product-Documentation:** Product with Label



purchased in about 1980 at Seibu Department Store, Kichijoji, Tokyo. Blue and gold on white plastic film. Made from soybeans grown in Japan. With a tiny packet of mustard inside.

840. Matsui, K.; Kikuno, K.; Kameda, Y. 1980. Reactivity and function of sulfhydryl groups in alanine dehydrogenase of *Bacillus natto* KMD 1126. *Chemical and Pharmaceutical Bulletin* 28:1503-08. (Chem. Abst. 93:91050. 1980). \*

841. Matsumoto, H.; Take, T. 1980. [Studies on the utilization of bean curd lees. II. Selection of the *B. natto* strain]. *Niigata Daigaku Kyoikugakubu Kiyo, Shizen Kagaku Hen (Memoirs of the Faculty of Education, Niigata University, Natural Science)* 22:53-63. (Chem. Abst. 95:131133). \*

842. Ohkuro, I.; Komatsuzaki, T.; Kuriyama, S.; Kawashima, M. 1980. [The loss and recovery of mucilage of natto bacilli by continued cultivation]. *Igaku to Seibutsugaku (Medicine and Biology)* 101:207-09. [Jap]\*

843. Tanaka, Teruo. 1980. Cloning vehicles for the homologous *Bacillus subtilis* host-vector system. *Gene* 10:131-36. \*

Address: Mitsubishi Kasei Inst. of Life Sciences, 11 Minamiooya, Machida, Tokyo, Japan.

844. Bhumiratana, Amaret. 1980. Traditional fermented foods in Thailand. In: 1980. Proceedings of the Oriental

Fermented Foods. Food Industry Research and Development Institute, P.O. Box 246, Hsinchu, (300) Taiwan. iv + 229 p. See p. 58-70. [19 ref]

• **Summary:** Tao-jeow is Thai miso. Sufu is fermented tofu. The author uses the terms tao-nou and thuo-nao instead of thua-nao throughout; he even misspells it when citing Sundhagul 1970. It is sold as a paste or chips. Soy sauce (the Chinese type), soy paste and fermented soybean curd are commonly available throughout the country although they are more common in the Chinese community. Tao-nou, however, is the product which is popular in the northern part of the country. Flowcharts show the processes for producing soy sauce and tao jeow, tofu and sufu, and thuo-nao.

Note: This is the earliest (and only) English-language document seen (Jan. 2012) that uses the term “tao-nou” or the term “thuo-nao” to refer to thua-nao. Address: Dep. of Microbiology, Faculty of Science, Mahidol Univ., Rama VI Rd., Bangkok 4, Thailand.

845. Doi, Tadao; Takeshi, Morita; Chonan, Minoru. 1980. *Hôyaku Nippo jisho* [Vocabulary of the language of Japan]. Tokyo: Iwanami Shoten. xxxiv + 862 p. 27 cm. [Jap; Por]

• **Summary:** This is a Japanese-language translation of the original 1603 edition, *Vocabulario da Lingua de Iapam*, the second earliest dictionary of the Japanese language compiled by Europeans. Soy-related terms in this dictionary, which are translated from the original hard-to-read Portuguese into modern Japanese, are described in detail at the reference for the original 1603 dictionary, which see.

In the Forward, the author notes that this is the entire translation of the Nagasaki edition of the Japanese Portuguese Dictionary. The original title is *Vocabulario da Lingoa de Iapam com a declaracao em Portugues* (Japanese dictionary with explanation in Portuguese), published in 1603 by the Japanese Society of Jesus (Nihon Iezuzu-kai). In 1604 a second dictionary was published, titled *Arte da Lingoa de Iapam Composta Pello Padre Iaa Rodriguez* (1604-1608).

Christian priests traveled by boat to Japan to teach the Japanese Christianity. As a result, they left many historical documents. Francis Xavier first arrived in Japan in 1549 and only 54 years later his group published this remarkable Japanese dictionary. The year 1603 was also the year that Tokugawa Ieyasu became the shogun (Seiitaishogun, or highest ranking samurai), founding the Tokugawa Shogunate or Edo period. In Japanese history it was the turning point at which the country changed from the medieval period to the modern one. This dictionary is a very unique mirror which reflects this period and is regarded as an important document that raises many questions in Japanese cultural history. The dictionary is indispensable in Japanese linguistic history since it contains many Japanese words of the period with explanations in Portuguese. In those days the Japanese had dictionaries that focused on Chinese characters (kanji)

and simple dictionaries for waka and renka poems. This dictionary picked up a wide range of words from daily conversation, organizing and defining them in modern dictionary form. The original edition was stored in a secret place in Europe, inaccessible to Japanese, who therefore had to largely depend on a 19th century French translation by Leon Pajes. A rotogravure edition of the book stored at Oxford University entered Japan during the Taisho period (1912-1926) and was studied. Only recently was a facsimile copy of the original edition published, and it is being used increasingly.

This dictionary was produced by the Japanese Society of Jesus [Jesuits] to further their goal of spreading Christianity. The 1603 dictionary was developed to help the priests understand dialects, lower-class speech, and the confessions of the local common people. The 1604 dictionary focused on the speech of the upper classes and more educated people. Thus the 1603 dictionary collected words the priests needed to understand, while the 1604 dictionary collected those that they wanted to use.

846. Fukushima, Danji; Hashimoto, Hikotaka. 1980. *Oriental soybean foods*. In: F.T. Corbin, ed. 1980. *World Soybean Research Conference II: Proceedings*. Boulder, Colorado: Westview Press. xv + 897 p. See p. 729-743. [7 ref]

• **Summary:** Contents: Fermented soybean foods. Non-fermented soybean food. Conclusion. References.

The following statistics show the amount (tons) of whole soybeans / defatted soybean grits / total of whole and grits consumed for various soybean foods and feeds in Japan in 1976.

Fermented soyfoods: Shoyu (soy sauce) 10,000 / 165,000 / 175,000, miso 190,500 / 5,000 / 195,500. Natto 69,000 / 0 / 69,000.

Non-fermented soyfoods: tofu and aburage (fried tofu pouches) 411,500, 55,000 / 466,500. Kori-tofu (dried-frozen tofu) 29,000 / 0 / 29,000. Others 16,000 / 75,000 / 91,000.

Animal feeds: 30,000 / 1,950,000 / 1,980,000. Thus total use for foods and feeds is whole soybeans 756,000. Defatted soybean grits 2,250,000, total of both 3,006,000. By type of use, animal feeds account for 65.9% of total Japanese usage of whole soybeans and defatted grits, non-fermented soyfoods account for 19.5%, and fermented soyfoods account for 14.6%. The top three food users are tofu (466,500 tons, 45.5% of all food uses), miso (195,500), and shoyu (175,000). There are 35,000 tofu plants in Japan.

Fermented soybean foods described are shoyu (soy sauce; 5 types), miso (3 basic types, 6 varieties), sufu (Chinese soybean cheese), tempeh (fermented soybean cake), natto (fermented whole soybeans; itohiki-natto and hama-natto), and fermented soymilk (recently a new fermented soybean product appeared on the market in Japan. It is a soy milk drink fermented by lactic acid bacteria).

Non-fermented soybean foods described are tofu (soy



milk curd), aburage (fried tofu pouches), kori-tofu (dried-frozen tofu), yuba (coagulant film of soy milk), kinako (roasted soybean powder), moyashi (soybean sprouts), and soybeans. Production, chemical composition, and use of each of these foods is discussed.

Figures (flow sheets) show: (1) Shoyu manufacturing process. (2) Rice miso manufacturing process. (3) Sufu manufacturing process. (4a) Tempeh manufacturing process. (4b) Natto manufacturing process. (5a) Tofu manufacturing process. (5b) Kori-tofu manufacturing process. Address: Kikkoman Foods Inc., P.O. Box 69, Walworth, Wisconsin 53184.

847. Iwamoto, H. 1980. General aspects of Japanese fermented foods. In: Proceedings of the Oriental Fermented Foods. Food Industry Research and Development Institute, P.O. Box 246, Hsinchu, (300) Taiwan. iv + 229 p. See p. 31-45. Held 10-14 Dec. 1979 in Taipei, Taiwan. 15 tables. 2 figs. • **Summary:** The fermented foods indigenous to Japan which are made from protein-rich materials can be grouped into two types: the soybean group and the fish group. The former, which includes miso, shoyu, and natto, is the more popular and production is very large. The author presents an early history and genealogy of miso, shoyu, and natto based on the Japanese-language writings of Prof. K. Sakaguchi and Prof. M. Nakano. Shi [fermented black soybeans] were recently found in an ancient Chinese tomb of the 2nd century B.C. "The word *shoyu* or *chiang-yu* never appeared in any old Chinese manuscripts. Nevertheless I wonder if the origin of Japanese shoyu might be the Chinese *chiang* in the Ming dynasty or an earlier period. Anyhow, the question is still: When did the Chinese start making koji from a mixture of soybean and wheat? And when and where was filtration of soybean *chiang* successfully commenced. As for the later, it is quite possible that the filtration was started in Japan."

In 1977 the following amounts of fermented soyfoods were produced in Japan: miso 620,902 tonnes (using 190,000 tonnes of whole soybeans and 1,579 tonnes of defatted soybean meal), shoyu 1,228,244 tonnes (using 11,788 tonnes of whole soybeans and 180,000 tonnes of defatted soybean meal), and natto 120,000 (using 71,000 tonnes of whole soybeans).

Table 2 shows soybean production in Japan and the USA every 5 years from 1930 to 1978. Production in Japan was 388,600 tonnes in 1930, reaching a peak of 507,100 in 1955, falling to a low of 109,500 in 1976, then rising slightly to 187,900 in 1978. The first year for which imports are shown is 1970, when 3,243,790 tonnes were imported, 91% of which from the USA. In 1978 4,260,041 tonnes were imported, 97% from the USA.

Table 6 shows miso production in Japan from 1967 to 1976. Factory production grew from 535,000 tonnes in 1967 to a peak of 650,000 tonnes in 1973, down slightly to 630,000 tonnes in 1976. Farmer (household) production

decreased steadily from 207,000 tonnes in 1967 (39% of factory production and 26% of total production) to 67,000 tonnes in 1976 (11% of factory production and 10% of total production). Total production and annual per capita consumption decreased from a peak of 789,000 tonnes in 1967 (7.8 kg/capita) to a low of 697,000 tonnes in 1976 (6.5 kg/capita).

Table 7 shows the number and capacity of miso factories in Japan and their production in 1959, 1968, and 1977. The number of factories decreased dramatically during this 18-year period (to from 2,987 to 1,996), but the total amount of miso produced increased 503,000 tonnes to 621,000 tonnes, and the percentage of all miso made by large factories (those making 3,751 tonnes/year or more) rose from 15% to 52%, while the percentage of all miso made by small factories (those making 1-375 tonnes/year) decreased from 29% to 14%.

Table 8 shows the materials used in making shoyu in Japan from 1968 to 1977. The amount of whole soybeans decreased from 15,000 tonnes to 9,000 tonnes, the amount of defatted soybean meal increased from 147,000 tonnes to 176,000 tonnes, the amount of wheat increased from 127,000 to 178,000 tonnes, and the amount of salt from 170,000 tonnes to 204,000 tonnes. The amount of amino liquor (HVP) decreased from 140,000 tonnes to 89,000 tonnes.

Table 9 shows shoyu production in Japan from 1967 to 1976. Factory production grew from 1,201 kiloliters (kl) in 1967 to a peak of 1,403 kl in 1973, down slightly to 1,349 kl in 1976. Farmer (household) production decreased steadily from 20 kl in 1967 (1.67% of factory production 1.63% of total production) to 9 kl 1976 (0.66% of factory production and 0.66% of total production). Total production and annual per capita consumption increased from 1,221 kl 1967 (12.0 liters/year) to a high of 1,411 kl in 1973 (12.6 liters/year), then down slightly to 1,355 kl in 1976 (11.9 liters/year). Table 10 shows that in 1977 there were 3,135 shoyu factories in Japan. Of these, 2,654 (85% of the total) were in the smallest scale, having 10 or fewer employees, while 5 had 201-300 employees, and 8 had 301 or more employees.

Fig. 2 shows the percentage of shoyu that is distributed through various channels as it moves from the factory to large or small consumers. Address: College of Agriculture, Meiji Univ., Ikuta, Tama-ku, Kawasaki-shi, Japan.

848. Nakamura, Hiroshi. 1980. Desirable qualities of soybeans—Japanese viewpoints. In: F.T. Corbin, ed. 1980. World Soybean Research Conference II: Proceedings. Boulder, Colorado: Westview Press. xv + 897 p. See p. 1-9. • **Summary:** The author believes that both protein and oil contents should be incorporated in soybean quality standards. "I think efforts should be made to develop different varieties for different uses, so that soybeans could be traded on an oil or protein basis in the future." Address: Hohnen Oil Co., Ltd., Tokyo, Japan.

849. Pennington, Jean A.T.; Church, Helen Nichols. eds. 1980. *Bowes and Church's food values of portions commonly used*. 13th ed. Philadelphia, Pennsylvania: J.B. Lippincott Co. xvii + 186 p. Index. 28 cm. 1st ed. was 1937. 2nd ed. was 1939. 10th ed. was 1966. [62 ref]

• **Summary:** The index contains entries for: Beans (but no soy). Cheese and cheese food (but alternatives). Cheez-its, Chili-vegetarian. Float, Dairy Queen. Flour. French fried potatoes (Arthur Treachers, Burger Chef, Burger King, Dairy Queen, Long John Silver's, McDonald's, Wendys). Ice cream bars. Infant formulas (Isomil-Ross Labs, L-Soyalac-Loma Linda, Neomullsoy-Syntex, Nursoy, ProSobee-Mead Johnson, Soyolac-Loma Linda). Irishmoss [Irish moss]. Milk (goat, human, Indian buffalo, reindeer, sheep, soybean, whole). Miso. Natto. Oils. Soyamaise dressing (p. 122). Soyamel. Soybeans, fermented. Soybean curd. Soybean flour. Soybean milk. Soybean nuts. Soybean oil. Soybean protein. Soysauce. Teriyaki sauce. Tigers Milk Bar. Tofu. Tom Collins. Veg Skalops. Veja-Links. Vegeburger. Vegetarian products made mostly by Worthington Foods and Loma Linda (p. 22-23): Beef style roll, Chicken style, Chic-Ketts, Chili, Corned beef style, Croquettes, Dinner cuts, Fry Sticks, Gran Burger, Meatloaf mix, Nuteena, Prosage, Proteena, Rediburger, Smoked beef style, Stakelets, Stripples, Tasteecuts, Turkey Style-Smoked, Vega-links, Vegeburger, Veg Skalops, Vegetarian Burger, Vitaburger, Wham. Yogurt.

Aluminum is not among the lists of trace minerals in foods in the back. The book *does* list the following as trace minerals: chromium, cobalt, fluoride, iodine, molybdenum, nickel, selenium, and tin. Address: 1. Formerly Instructor of Nutrition, City College of San Francisco, San Francisco, California [Now with U.S. Food and Drug Administration, Washington, DC]. Phone: 202-245-1064.

850. *Quadernos de Natura (Editorial Posada, Mexico)*. 1980. *La alimentacion macrobiotica [The macrobiotic diet]*. No. 10. 88 p. [10 ref. Spa]

• **Summary:** Includes information on miso, natto, tamari, tekka miso, and sea vegetables.

851. *New York Times*. 1981. Dining out guide: Japanese restaurants. Jan. 4. p. D55.

• **Summary:** This is a list of the 11 best Japanese restaurants in New York City based on reviews that appeared in the *New York Times*. One of these is Hatsuhana, which features a sushi bar. Among the recommended dishes is "natto, a pungent mix of fermented [soy] beans,..."

852. Root, Waverley. 1981. A cordial bow to the byproducts of the soybean. *Los Angeles Times*. Jan. 15. p. J42.

• **Summary:** This article is indebted to: Simonds, Nina. 1979. "Chinese cuisine: Bean curd." *Gourmet*. Sept. p. 28-29, 84-

91.

The soybean, which offers extraordinary versatility as a human food, can be transformed into soybean milk, "the soybean milk skin [yuba] derived from the milk, the bean sticks [dried yuba sticks] made from the milk skin, the also edible sediment given off by the milk [okara], untreated bean curd [regular tofu and perhaps silken tofu], pressed bean curd which produces bean curd noodles [pressed tofu noodles], more tightly compressed bean curd cakes, and frozen-and-thawed bean curd [dried frozen tofu]." Note: This is the earliest English-language document seen (Nov. 2011) that uses the term "frozen-and-thawed bean curd" to refer to dried frozen tofu.

In the process of making "pressed bean curd, another soybean food is created—bean curd skin [*pai yeh*, pressed tofu sheets], which should not be confused with soybean milk skin [yuba]. Dried bean curd skin," which needs no refrigeration and is often stuffed, for example with chopped meat, is sold by weight by Chinese specialty shops throughout the world; five or six sheets weigh one ounce.

"There is a whole family of foods made from fermented bean curd" [fermented tofu]. Bean curd can be fermented in various ways. Bean curd loaves, for example, can be stored for the winter in a cool dark place; micro-organisms from the air cause fermentation. "The loaves acquire a fungoid coating, which has to be scraped off, and as far as I know is not used for food,..." Fermented bean curd, which has been called "soybean cheese," is easier to digest than unfermented bean curd. Bean curd can also be marinated in rice wine, flavored with spices, and then allowed to ferment. A most unusual type of fermented tofu is stinky bean curd (*sh'ou tou fu*), a favorite Chinese snack. In Taipei, there are many street vendors who ply the streets with their portable deep fryers. This fermented tofu is usually deep-fried and usually eaten with one's choice of soy sauce, vinegar, mashed garlic, and chili paste.

Other fermented foods include miso, natto, hamanatto (which is of Korean origin), tempeh (of Indonesian origin), and shoyu (Soybean sauce, soy sauce).

"It is said that the best grades of soy sauce can take as much as six to seven years of aging to reach perfection, and that the making of a superb soy sauce requires 'as much art in its preparation as good French wines.'"

Flavorings are added to some Chinese soy sauce "various herbs, especially citronella; spices (ginger); aromatic vegetables (onions); and not only fermented fish, but even fermented chicken meat. To produce three liters (3.1 quarts) of sauce requires on kilogram (2.2 pounds) of beans.

"Fukien has the reputation of producing the best soy bean sauce in China and consequently stews many foods in it, giving them a color which has caused the culinary techniques of this region to be called 'red cooking.'"

Soybean sauce is "often an important ingredient in many more complicated sauces—for instance Hoisin sauce in China

and Worcestershire sauce in England.”

853. Wang, H.L.; Hesseltine, C.W. 1981. Use of microbial cultures: Legume and cereal products. *Food Technology* 35(1):79-83. Jan. [38 ref]

• **Summary:** Contents: Introduction. Use of nontoxin-producing cultures. Safety of fermented foods: Several factors contribute to their safety: Soaking and cooking, salting, acid formation, antibiotic production, alcohol production, low surface moisture, decrease of aflatoxin by *Rhizopus* and *Neurospora*. Shelf life of fermented foods. Nutritive value of fermented foods: Complementary effect of mixed proteins, protein efficiency ratio and digestibility, vitamins. Future of fermented legume-cereal foods.

The following fermented soy-related foods are described briefly, including names, area of origin, organisms used, substrate, and nature and use: Soy sauce (chiang-yu, shoyu, toyo, kanjang, kecap, see-ieu). Miso (chiang, doenjang, soybean paste, tauco). Fermented bean (hamanatto, tou-shih, tao-si). Sufu (fu-ru, fu-ju, tou-fu-ju, bean cake, Chinese cheese). Tempeh (tempe kedelele). Natto. Ontjom (onchom). Address: NRRC, Peoria, Illinois.

854. Sheraton, Mimi. 1981. Restaurants: Tempura treats, a neighborhood spot. *New York Times*. Feb. 13. p. 58.

• **Summary:** This is a review of Inagiku, a Japanese restaurant inside the Waldorf-Astoria at 111 East 49th St. They serve “soba (cold buckwheat noodles enlivened with soy sauce and scallions),...” and “small dishes such as nimono, a combination of simmered vegetables and bean curd [tofu]...” Also teriyaki fish.

“At one dinner we asked a waiter for natto, a cool side dish of fermented soybeans in a spicy, eggy sauce...”

855. Tanaka, Teruo; Kawano, N.; Oshima, T. 1981. Cloning of 3-isopropylmalate dehydrogenase gene of an extreme thermophile and partial purification of the gene product. *J. of Biochemistry (Tokyo)* 89(2):677-82. Feb. [28 ref. Eng]

• **Summary:** “Amplification [purification] of specific enzymes has been achieved by the recent technology of recombinant DNA.” This paper describes another method using a recombinant plasmid. The gene of an extreme thermophile, *Thermus thermophilus* HB8, which codes for a leucine biosynthetic enzyme, was cloned in *E. coli* using the recombinant plasmid, pBR322 as a vector. Address: Laboratory of Biochemical Reactions and Biocatalysts, Mitsubishi-Kasei Inst. of Life Sciences, Minamiooya, Machida, Tokyo 194, Japan.

856. Tsukamoto, J.Y. 1981. 1980 soybean activities in the Prairie Provinces. Paper presented at the 36th Annual Meeting of the Expert Committee on Grain Breeding (ECGB). 15 p. Held 16-17 Feb. 1981 at Edmonton, Alberta, Canada.

• **Summary:** The Prairie Provinces are Manitoba, Saskatchewan, and Alberta. This paper consists of 3 parts. Part 1 (p. 1-6, incl. Appendix I) is the basic presentation by Joe Tsukamoto, which focuses on developments in Manitoba. Approximately 7,000 bu of Maple Presto were harvested from a demonstration project and crushed at C.S.P. Foods in Altona to determine the commercial acceptance of this variety.

Part 2 (Appendix II, p. 7-14) is titled “The development of new short-season soybean varieties,” by H.D. Voldeng of Agriculture Canada, Ottawa. “There are four characteristics that are of special concern to the plant breeder when he evaluates the potential of a promising new strain: yield, maturity, oil content and protein content. Growers are particularly interested in yield and maturity, whereas industry is concerned with oil and protein levels... In general higher yields are produced by later maturing cultivars.” According to table 1, the variety that matures in the shortest time, Maple Presto, requires only 101 days in Manitoba, and gives a yield of 1,980 kg/ha.

Part 3 (Appendix III, p. 15) is titled “Report on soybeans in Southern Alberta, 1980,” by Hans-Henning Muendel of Agriculture Canada Research Station, Lethbridge, Alberta T1J 4B1, Canada. It discusses commercial trials (including tests of small-seeded “natto” types), agronomic and physiological studies, and varietal testing and breeding. Address: Manitoba Agriculture.

857. Batra, L.R. 1981. Re: Kenima [sic, kinema]. Letter to William Shurtleff at Soyfoods Center, March 24—in reply to inquiry of March 5. 1 p. Typed, with signature on letterhead.

• **Summary:** “Thank you for your letter of March 19, 1981. As you state you already have the published information I have to offer on kenima. Nearly all of the questions you raise are discussed in the paper to be published by Pergamon Press. Some of those not addressed are answered below. You do a great service in popularizing our subject and I will be of course pleased to send you a reprint of the article.

“1. The primary organism involved is *Bacillus subtilis*.

“2. I do not know much about the history of the food but I have been searching the Chinese literature for clues.

“3. Kenima is an adjunct food; it is often cooked with vegetables of assorted kinds.

“4. There is no binder used to deep-fry or pan-fry the food. It is fried in small patties.

“5. There is no packaging involved. It is retailed from a large mass wrapped in leaves at stores selling vegetables.”

All of my publications are in the public domain while I am a U.S. government employee. Address: Research Mycologist, Mycology Lab., USDA / SEA, Agricultural Research, Northeastern Region, Beltsville Agricultural Research Center, Beltsville, Maryland 20705.

858. Fukushima, D. 1981. Soy proteins for foods centering

around soy sauce and tofu. *J. of the American Oil Chemists' Society* 58(3):346-54. March. [41 ref]

• **Summary:** Contents: Abstract. Introduction. Soy sauce varieties: Koikuchi, usukuchi, tamari, saishikomi, and shiro shoyu. Soy sauce manufacturing process (for each of the 5 types). Miso. Other fermented products: Tempeh and natto. Tofu and related products: Regular and silken tofu, dried-frozen tofu, deep-fried tofu. Fermented tofu (Sufu). Other soy products: Soy milk, fermented soy milk beverages, yuba.

This paper discusses traditional Oriental soy protein foods which are growing rapidly in popularity in the USA among non-Asian-Americans.

“Generally speaking, soy sauce is divided into two groups: fermented soy sauce and chemical soy sauce. Fermented soy sauce has a long history as a human food, whereas chemical soy sauce has a history of only several decades. In fermented soy sauce, the proteins and carbohydrates contained in the materials are hydrolyzed very slowly under mild conditions below 30°C for over six months, whereas in chemical soy sauce they are hydrolyzed quickly by hydrochloric acid at 80°C for 8-10 hours. Chemical hydrolysis is a cheap and rapid process, but during the hydrolysis, various secondary reactions occur and produce undesirable compounds, e.g. dark humins, furfural, dimethyl sulfide, hydrogen sulfide, levulinic acid and formic acid, which are not present in fermented soy sauce. Furfural, dimethyl sulfide and hydrogen sulfide, which have strong, bad odors in themselves, are derived from pentose, methionine, and sulfur-containing amino acids respectively. Furthermore, tryptophane, one of the nutritionally important amino acids, is destroyed almost completely. As shown in Figure 1 [two chromatograms], the main organic acid of fermented soy sauce is lactic acid, whereas the main organic acid of chemical soy sauce is formic acid. Levulinic acid, present in chemical soy sauce, does not exist naturally.

“To improve the odors of chemical soy sauce, semichemical soy sauce was devised. It is made by hydrolyzing raw soybeans with a lower concentration of hydrochloric acid (7-8%) as the first step, followed by fermenting the hydrolysate with osmophilic yeasts in the presence of wheat koji.” In Japan, chemical soy sauce is not used as a soy sauce in itself, but as an extender for fermented soy sauce.

Table 1 gives the typical chemical composition (per 100 ml) of the five varieties of traditional soy sauce in Japan, including Bé [Baumé; a measure of the relative density of liquids], sodium (koikuchi is lowest at 17.6%, usukuchi is highest at 19.2%), total nitrogen (koikuchi has 1.55 gm, tamari has 2.55 gm or 65% more), formol nitrogen, reducing sugar, alcohol (koikuchi is 2.2%, by far the highest), pH (ranges from 4.6 to 4.8), and color.

A brief description of each of the five traditional varieties: (1) Koikuchi: This “dark-colored” shoyu is by far the most popular of the five types of fermented soy

sauce in Japan, comprising 85% of the total. It is an all-purpose seasoning with a strong aroma, complex flavor, and deep, reddish-brown color. These characteristics are mainly derived from the use of equal amounts of wheat and soybeans in the koji; (2) Usukuchi [light-colored] shoyu is characterized by a lighter, red-brownish color and a milder flavor and aroma. It is used mainly for cooking when one wishes to preserve the original flavor and color of the food itself. As in koikuchi, equal amounts of soybeans and wheat are used in the koji, but the fermentation is done under conditions which prevent the development of a dark color. (3) Tamari shoyu has a higher amino acid content, but it lacks aroma. The koji is made primarily from soybeans with little or no wheat. (4) Saishikomi (twice-fermented) shoyu is made using equal amounts of wheat and soybeans in the koji, but using raw (unpasteurized) soy sauce instead of salt solution, which is mixed with the harvested koji. Saishikomi is characterized by aroma and full-bodied taste. (5) Shiro (clear, or “white”) shoyu is made by using a very high ratio of wheat to soybeans in the koji, and further by fermentation under conditions which prevent dark color development. It is characterized by a very light yellow to tan color, though the amino acid content is very low because of the low soybean content in the koji. Flow sheets show the process for manufacturing koikuchi, usukuchi, and tamari shoyu. Each has three basic parts: Koji making process, brine fermentation process, and refining process.

Concerning soy sauce production and consumption: The total annual production of soy sauce in Japan in 1979 reported by the Japanese Agricultural Standard (JAS) was 1,252,431 kiloliters (kl). In 1979 in Japan, about 70% of the soy sauce products in Japan were purely fermented, 25% contained some semichemical soy sauce, and the remaining 5% contained chemical (HVP) soy sauce. The most recent estimates of annual consumption of soy sauce in the USA are as follows: Fermented soy sauce 17,850 kl; Chemical (HVP) soy sauce 25,500 kl. Within fermented soy sauce, production of koikuchi soy sauce is estimated to be 16,500 kl/year.

In Japan an “instant tofu powder” is actually a spray-dried soy milk. This product was made and introduced by *Nihon Tanpaku Kogyo* (Japan Protein Industry) about 15 years ago (ca. 1966) and was used mainly as a raw material for making regular or silken tofu in order to save time. “Recently, however [1973], the product was placed on the market as an instant powdered tofu [named *Hausu Hontôfu*] by Hausu [House] Foods Co.”

A photo shows D. Fukushima. Address: Kikkoman Foods, Inc., Walworth, Wisconsin 53184.

859. Haytowitz, David B.; Marsh, Anne C.; Matthews, Ruth H. 1981. Content of selected nutrients in raw, cooked, and processed legumes. *Food Technology* 35(3):73-74. March. [11 ref]

• **Summary:** Contents: Introduction. Peanuts and soybean

products (soy flours, soy isolates, soy concentrates). Conventionally cooked legumes. Oriental legume products (includes tofu, tempeh, soy sauce, miso, and natto). Address: Consumer Nutrition Center, Human Nutrition, Science and Education Administration, USDA, Hyattsville, Maryland 20782 USA.

860. Shurtleff, William; Aoyagi, Akiko. 1981. The book of miso: Food for mankind. Revised. New York, NY: Ballantine Books. xx + 618 p. March. Illust. by Akiko Aoyagi Shurtleff. Index. 18 cm. [82 ref]

• **Summary:** Contents: What is miso? Preface. Acknowledgments. Part I. Miso: Savory, High Protein Seasoning. 1. Soybeans, protein and the world food crisis. 2. Miso as a food. 3. The miracle of fermentation. 4. The varieties of miso: Regular Miso: Rice miso (red / aka, light-yellow / shinshu, mellow red / amakuchi akamiso, mellow beige / amakuchi tanshoku, mellow white / shiro koji, sweet red / edo or edo ama-miso, sweet white / Kyoto shiro miso), barley miso (karakuchi mugi, mellow barley / amakuchi mugi), soybean miso / mamé miso (miso-dama, Hatcho miso, soybean miso / mame miso, tamari miso). Special Miso: Finger lickin' miso / Namemiso (Kinzanji miso, moromi miso, hishio, namémiso, natto miso, goto miso), sweet simmered miso / nerimiso. Modern Miso: Akadashi miso, dehydrated or freeze-dried miso, low-salt / high-protein miso.

Part II. Cooking with Miso (400 recipes). 5. Getting started. 6. Recipes from East and West. Part III. The Preparation of Miso. 7. Making miso at home and in communities. 8. Japanese farmhouse miso. 9. Traditional and modern miso production.

Appendixes: A. A history of chiang, soy nuggets [fermented black soybeans], miso, tamari, and shoyu. B. Other East Asian misos: Chiang, jang, taicho, and tausi. C. The microbiology and chemistry of miso fermentation. D. People and institutions connected with miso. E. Miso additives. F. Miso with seafoods, chicken, and meat. G. Measures, weights, and equivalents. H. So you want to study miso in Japan? Bibliography. Glossary.

Note: This is the earliest English-language document seen (Nov. 2011) that uses the term “soy nuggets” to refer to Fermented black soybeans. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

861. Taira, Harue; Taira, Hirokadzu; Ushirogi, Toshizo; Tanimura, Yoshimitsu; Wada, Tuguo; Kawasaki, Yoshihiro; Suzuki, Norio; Koyatsu, Hiroyasu; Takei, Reiko; Kikuchi, Shiyoko; Tamura, Katsuichi. 1981. Daizu shushi no kansô shori hôhō to sono hinshitsu ni tsuite. V. Daizu shokuhin e no kakô tekisei oyobi tôfu, nattô no kôjô seizô shiken [Influence of dry treatment after harvest on quality of soybean seeds. V. Qualities for soybean food processing and tests for factory production qualities for soybean food processing and tests

for factory production of tofu and natto]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 38. p. 23-32. March. [12 ref. Jap; eng]

• **Summary:** Two harvesting methods and 4 drying methods were tested. Address: 1-2. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 3-4. Hokkaido Prefectural Central Agric. Exp. Station, Naganuma, Hokkaido.

862. Ohta, Teruo. 1981. Re: Answers to questions about natto. Letter to William Shurtleff at Soyfoods Center, March 4. 1 p. Handwritten, with signature on letterhead. [Jap]

• **Summary:** The six largest prefectures in Japan in terms of annual natto production and per capita expenditure.

(1) Ibaraki prefecture makes 27,000 metric tons/year. In Mito city the annual per capita expenditure on natto is ¥4,789.

(2) Miyagi prefecture makes 18,000 metric tons/year. In Sendai city the per capita expenditure is ¥2,569.

(3) Hokkaido prefecture (island) makes 9,000 metric tons/year. In Sapporo city the per capita expenditure is ¥2,375.

(4) Tokyo city (*Tokyo-to*) makes 4,500 metric tons/year. In Tokyo city the per capita expenditure is ¥1,737.

(5) Tochigi prefecture makes 2,700 metric tons/year. In Utsunomiya city the per capita expenditure is ¥3,028.

(6) Aomori prefecture makes 1,800 metric tons/year. In Aomori city the per capita expenditure is ¥3,894.

1. The character for natto first appeared in the Shin Sarugakuki (1058-68), by Fujiwara Akihira, however this concerned fermented black soybeans not itohiki natto.

4. Natto research was published in 1905 by Dr. Shin Sawamura.

5. The English translation of *kosokin* is *Bacillus subtilis*.

6. The English translation of *eiyo saibo* is “vegetable cell.”

7. Dr. Hanzawa Makoto of Hokkaido University was the father of modern Natto production.

9. In *Daizu Shokuhin* Dr. Ohta states that the ratios of ingredients for making natto hishio are (by weight) natto 5, koji 4, and salt 1.

12. Today in Japan, most commercial natto makers use only one strain of natto bacteria, not two. Address: Tsukuba, Japan.

863. Lukoskie, Suni Kim. 1981. Re: Korean natto and miso. Letter to William Shurtleff at Soyfoods Center, April 20—in reply to inquiry of March 5. 1 p. Typed, with signature on letterhead.

• **Summary:** About Joenkuk-jang and Damsue-jang. I always call them Chungkuk-jang and Dambuk-jang.

To eat and serve them, we make pretty thick Miso type

soup with Tofu and Vegetables in it. This is the miso that we can make very easily and quickly in the winter time.

I can't explain what they look and taste like, but I'm sure you could buy them at Korean grocery stores in California.

I don't know when or where they originated in Korea.

Chungkuk-jang and Dambuk-jang are made by almost the same process. (1) Chingkuk-jang: Wash soybeans then soak for 10-12 hours. Cook for 5-6 hours until they are very tender so that when you touch them they crumble. Put them in a bowl and leave it in the room with a blanket over it; no culture is added. After 2-3 days the surface will be white and sticky, and it smells rotten. Then add salt, garlic and cayenne, and pound it until coarse. This is the traditional method. As you may know, the Korean floor is very warm in the winter time.

Another method is to make it more like making tempeh. My text-book says that after cooking the beans add the culture then incubate them 30-35 hours at 40°C.

Dambuk-jang: Same as above but no spices.

The Korean word for okara is BéGé [piji].

People in Korea don't eat whole soybeans much, except that sometimes we roast them.

I have never eaten green vegetable soybeans in Korea. I don't think we even have word for them in Korean. But the general name for soybean is *Mayjekwong*.

Note: Suni married to Luke Lukoskie. Address: 1. Island Spring Inc., P.O. Box 747, Vashon, Washington 98070. Phone: 206-622-6448.

864. *Toyo Shinpo (Soyfoods News)*. 1981. Karushiumu iri "kenkô nattô", (Kabushikigaisha) Tokusan-sha ga hatsubaichû: Ippanryûtsû nimo ryôkô. Gakkô kyûshokuyô shokuhin ni jitsuyô ninka sareteiru karushiumu "Karunaa." Gakkô kyûshoku deno nattô juyô fueru, Karushiumu Nattô no shûhen ["Healthy Nattô" with calcium added is on the market, made by Tokusan-sha (KK): It has a good reputation with a regular distribution too. School lunch program usage approved calcium (natto) "Kalner." The demand for natto increased school lunches because of calcium nattô]. April 21. p. 16. [Jap]

• **Summary:** A photo shows the front of four new natto (with calcium added) packages.

865. Aumayr, Andrea; Hara, Toshio; Ueda, Seinosuke. 1981. Transformation of *Bacillus subtilis* in polyglutamate production by deoxyribonucleic acid from *B. natto*. *J. of General and Applied Microbiology (Tokyo)* 27(2):115-23. April. [21 ref]

• **Summary:** A specific regulator gene (or genes) is reported to be involved in PGA production of *Bacillus natto*. The gene could be transferred from *Bacillus natto* Asahikawa to *Bacillus subtilis* Marburg 168 by the DNA-mediated transformation.

Note: This is the earliest document seen (Jan. 2012) that mentions the Asahikawa strain of *Bacillus subtilis* (*natto*). Address: 1. Dep. of Food Science and Technology, Faculty of Agriculture, Kyushu Univ., Hakozaki, Fukuoka 812, Japan.

866. Soyfoods Center; Soycrafters Assoc. of North America. 1981. Soyfoods Production in America and the West (News release). Lafayette, California: New-Age Foods Study Center. 1 p. April. Updated in Sept. 1981 in a neater format. • **Summary:** A table shows production statistics for 25 types of soyfoods. Number of manufacturers in the USA, Canada, Other West, Total; Tons of raw soybeans/year used by each food. Yield of food from 1 unit weight of soybeans. Wholesale value. Retail value. Number of people employed. Address: P.O. Box 234, Lafayette, California 94549.

867. *Compas (Le) (France)*. 1981. Cuisine: Soja d'hier, et d'aujourd'hui [Cookery: The soybean of yesterday and of today]. No. 17. p. 59-63. Spring. [Fre]

• **Summary:** Contains recipes for natto, miso, tofu, and tamari. With illustrations from books by Shurtleff & Aoyagi.

868. Hesseltine, C.W. 1981. Future of fermented foods. *Process Biochemistry* 16(3):2-6, 13. April/May. [11 ref] • **Summary:** Discusses shoyu, miso, natto, and tempeh in Korea, the USA, and Japan. There are nine factors that favor the increased use of fermented foods. Address: NRRC, Peoria, Illinois.

869. Wang, Hwa L. 1981. Oriental soybean foods: Simple techniques produce many varieties. *Food Development* 15(5):29-34. May.

• **Summary:** Methods of preparation are given for the following soyfoods: Tofu, soy sauce, miso, hamanatto, sufu, tempeh, natto. A table gives local names, descriptions, and uses for traditional East-Asian non-fermented soyfoods: "Fresh green soybeans (mao-tou, edamame)," soybean sprouts (huang-tou-ya, daizu no moyashi), soybean milk (tou-chiang), protein-lipid film (tou-fu-pi, yuba), soybean curd (tofu, tou-fu, tubu, tahoo, touhu, taufoo, dou-fu, dan-fu), and soybean flour (tou-fen, kinako). Local names, organisms used, substrate, and description of the product are given for traditional East-Asian fermented soyfoods: soy sauce, miso, hamanatto, sufu, tempeh, and natto.

Note: This is the earliest English-language document seen (Feb. 2004) that uses the word "taufoo" to refer to Chinese-style tofu. Address: NRRC, Peoria, Illinois.

870. Lee, Hyun Ja; Suh, Jung Sook. 1981. [Effect of *Bacillus* strains on Chungkook-jang processing. I. Changes of the components and enzyme activities during Chungkook-jang-koji preparation]. *Hanguk Yongyang Hakhoe Chi (Korean J. of Nutrition)* 14(2):97-104. June. [22 ref. Kor]

• **Summary:** Various types of koji were prepared using

*Bacillus natto*, *Bacillus subtilis*, and the traditional method. During koji preparation, its temperature was very different depending on the microorganism used—as was the content of ethyl alcohol, reducing sugar, amino nitrogen, and water soluble nitrogen. Address: 1. National An Seoung Agricultural Junior College; 2. Seoul Junior Health College.

871. Barber, Linda. 1981. Report with color slides on trip to natto maker, Marumiya, in Kumamoto City, Kyushu, Japan. Kobe, Japan. 1 p. Based on e-mail of Jan. 2012.

• **Summary:** Linda took these color slides during a trip to this natto maker in southern Japan.

(1) Soybeans (usually small in size) cooked in a pressure



cooker.

(2) Soybeans inoculated with natto bacteria and put into large bins.

(3) Lots of bins!

(4) Beans are wrapped in rice straw for fermentation. The rice straw was used at this factory, but natto was also fermented in foam trays as shown in last slide. Wonder if the rice straw is still used?

(5) Wrapped packages are laid in plastic basket trays for fermentation.

(6) Plastic basket trays of wrapped inoculated soybeans in temperature controlled rooms for fermentation.

(7) Natto unwrapped.



(8) Sticky strings of good natto.

(9) Typical serving suggestion.

(10) Natto sushi.

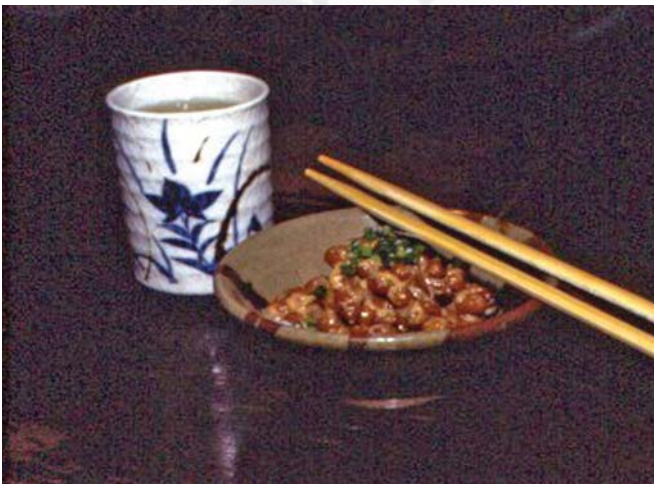
(11) Six natto products from this factory (from top left to bottom right): Tokyo Natto. Tokuyo Natto. Oyako Natto, Kawa-muki Natto. Natto packaged in rice straw. Small packet of natto (with orange cover). Address: Resident Director of Practice House and Oral English Instructor, Kobe College, 4-1 Okadayama, Nishinomiya, Japan.

872. Koyanagi, Tatsuo; Nakahara, K.; Uehara, A. 1981. Kôsan kazai (BHT) o ataeta rato no hatsuiku shôgai ni oyobosu daizu shokuhin oyobi methionin no tenka kôka [Effects of soybean foods and methionine on the growth of rats fed with an antioxidant (BHT)]. *Eiyogaku Zasshi (Japanese J. of Nutrition)* 39(4):165-70. July. (Chem. Abst. 95:218965 1981). [13 ref. Jap; eng]

• **Summary:** BHT = Butylated hydroxytoluene. The growth of rats fed with 0.3% BHT was stunted, but it was least stunted when they were fed with fortified natto. In the preparation of natto, the addition of 1% methionine to the soybeans at the time of soaking in water did not give rise to any disagreeable flavor; so fortification with methionine at this level appears to be a practical way to improve the nutritional value of natto. Address: Tokiwa Junior College [Mito City, Ibaraki Pref., Japan].







873. Shurtleff, William. 1981. William Morse: The father of soybeans in America (Continued—Part II). *Soyfoods* No. 5. p. 56-60. Summer.

• **Summary:** Continued: “It is truly remarkable that the authors were able to write such a complete and detailed book when neither of them had been to East Asia. (Morse would later spend two years there; 1929-1931.) Most of the book was actually written by Morse who, nevertheless, kindly listed Piper as the senior author. He gathered his information and photographs by extensive correspondence with researchers throughout East Asia and apparently drew heavily on a large collection of books on Chinese agriculture called the Swingle Collection, named after Walter T. Swingle of the Office of Crop Physiology, who spoke Chinese, had traveled extensively in the Orient collecting plants and the books, and had housed them at the USDA library, where Morse did much of his research. Decades ahead of its time, *The Soybean* soon became the standard work on the subject and was referred to by many as ‘the soybean bible.’ Dr. Piper died in February 1926 at the age of 69.

“Morse’s fine work was already starting to give real substance to Piper’s dream. In 1920, Morse helped to found the American Soybean Association (ASA) and thereafter helped to unify and direct an ongoing program of research and experimentation. Morse distributed seed from new introductions to anyone interested in soybeans. Among his closest contacts at the State Agricultural Experiment Stations were W.L. Burlison in Illinois and C.B. Williams in North Carolina. As late as 1927, most soybean agronomy research was still done on plots in Washington, D.C. outside the USDA south building. Morse sent out seeds to the states but farmers had problems; they shattered at maturity, were hard to harvest, and were abrasive on the binder canvas in those days before combines. Thus in the early years the tide of interest in soybeans ebbed and flowed. Doubters were always ready to laugh at anyone who talked of the soybean becoming a major U.S. farm crop. But this only served to spur Morse on to greater efforts. He was a very effective extension worker with many contacts, a deep knowledge of his subject, and good intuition. His desk at the USDA soon became the clearing house for information about the soybean. In 1927 he wrote: ‘We may keep this work going and place the soybean where it belongs—in the King row with King Corn and King Cotton.’

“The Dorsett-Morse Expedition to East Asia (1929-1931): In the late 1920s it became evident to the USDA that the soybean had definite promise as a crop in America and it was decided to send W.J. Morse and P.H. Dorsett to East Asia for two years on what was officially known as the Oriental Agricultural Exploration Expedition (but which people interested in soy usually call the Morse Expedition) to ‘make investigations regarding the utilization of the soybean in Oriental countries and the securing of varieties that might be of value to widespread American conditions’

(Morse, 1929). In 1929 when the expedition left, Morse was age 45 and had worked on soybeans with the USDA for 22 years. Dorsett (1862-1943), now age 67, was a plant explorer from the USDA Office of Plant Introduction; he was described by a fellow agricultural explorer, David Fairchild, as one of the most ingenious and indefatigable workers he had ever known. Whereas Morse was a specialist, interested in soybeans, Dorsett was a generalist, interested mainly in persimmons, but also in grasses, forages, and other plants.

“During the expedition, Morse and Dorsett kept detailed daily journal notebooks, which were typewritten after the trip and bound in 17 hardback volumes. These volumes, primarily the work of Dorsett, also contain correspondence plus thousands of black-and-white photographs taken by both men. In the bound volumes there are several references to a ‘special report on the soybean and its products’ that Morse intended to write. Apparently he never completed it, although he did complete detailed chapters on tofu and soymilk. The only original copy of the documents described above is in the archives of the American Soybean Association in St. Louis, Missouri. [Note: As of 2011, it is in Rare and Special Collections, at the National Agricultural Library, Beltsville, Maryland].

“The group arrived in Tokyo on March 18, 1929, and set up headquarters. In August they traveled to Hokkaido, the northernmost island of Japan and center of soybean production, where they studied both soybean cultivation and food uses. In December 1929 they returned to Tokyo and spent full time until March 1930 collecting soyfoods and studying their production and use. On April 1, 1930, they arrived in Dairen, Manchuria, to study soybean cultivation and oil extraction. Dorsett left Morse in the summer of 1930 and went to Peking. He did not rejoin Morse on the trip, although he wrote regularly. Morse went to Korea on August 22, to Mukden in Manchuria on September 29, back to Dairen, the oil-processing capital of East Asia, and then to Peking on October 20; Morse apparently spent only 20 days in China on the entire trip. In late December they took a ship from Dairen back to Kyoto and then Tokyo. On February 17, after several more months of soyfoods research in Tokyo, they sailed for America, arriving in San Francisco on March 4, 1931. Morse’s collection efforts—months of tramping through the fields of East Asia—were a bonanza. He discovered that almost every village in the Orient had its own distinctive soybean varieties, developed during thousands of years of close cultivation and inbreeding. Unlike their Western counterparts, Chinese farmers didn’t think of looking for improved varieties in nearby villages and then growing these in their own village. They loyally grew the varieties that had been handed down by their honorable ancestors, and wouldn’t dream of growing a variety handed down by someone else’s ancestors. Morse’s major accomplishments on the expedition were: (1) he collected approximately 4,600 distinct soybean seed samples

representing roughly 2,000 soybean varieties and including 150 large-seeded vegetable type varieties collected mostly in Korea and Japan; all of these were introduced into the U.S. germplasm collection; (2) he realized for the first time the superiority and potential of the vegetable-type soybeans for food use and later played the leading role in propagating them and teaching others of their value; (3) he developed a much better understanding of soybean growing methods and technology; and (4) he collected more than [commercial] 250 food products made from soybeans, which he took back to America, and did by far the most extensive studies on soyfood production of any Westerner up to that time.

“In his journals and letters, Morse wrote more than once that he was ‘amazed at the extent to which the soybean was used for food in Japan.’ He was intrigued by the techniques for making tofu, miso, shoyu, natto, and other soyfoods, spent many days in small shops with producers, and described their processes in great detail, taking hundreds of pages of typed text with hundreds of photographs.

“The two-year trip was a tremendous adventure for both Morse and Dorsett. Morse later remarked that he considered it the highlight of his career. He was finally able to fully grasp the great potential of the soybean, which he had only been able to glimpse through his years of reading and work in America.” Continued. Address: Soyfoods Center, P.O. Box 234, Lafayette, California.

874. Hara, Toshio; Aumayr, Andrea; Ueda, S. 1981. Characterization of plasmid deoxyribonucleic acid in *Bacillus natto*: Evidence for plasmid-linked PGA production. *J. of General and Applied Microbiology (Tokyo)* 27(4):299-305. Aug. [14 ref]

• **Summary:** Describes the discovery of a 5.7-kilobase plasmid, pUH1, which contains the gamma-glutamyl transpeptidase (gamma-GTP) gene responsible for polyglutamic acid production. Address: 1, 3. Dep. of Food Science & Technology, Faculty of Agriculture, Kyushu Univ., Hakozaki, Fukuoka 812, Japan; 2. Dep. of Microbiology, Innsbruck Univ., Innsbruck 6020, Austria.

875. Inkson, Ms.; Mann, E.J. comp. 1981. Thesaurus: Food Science and Technology Abstracts. 2nd ed. Shinfield, Reading, England: IFIS (International Food Information Service). 238 p. No index. 30 cm. First edition, 1977. [Eng]

• **Summary:** The Introduction states: “The original IFIS word list, issued in 1970, did not attempt to give more than the barest outline of the relations between the terms encountered. In 1977, therefore, an FSTA Thesaurus was published, in which the basic structuring of the material found in FSTA was set out. The Thesaurus was designed to give maximum compatibility with the EEC Multilingual (English / French / German / Italian) Food Thesaurus, published in 1979 (and itself based largely on the FSTA system for the English version), and to take into account the needs of on-line users.”

The terms are divided into headings (main terms or descriptors), which are printed in capital letters, and lead-in terms (non-descriptors) printed in lower case. Additional information is included in square brackets. The following abbreviations show the types of relationship between terms: BT = broader terms. NT = narrower terms. RT = related terms. UF = used for. lead-in term followed by “see” heading (e.g. bean curd see TOFU).

Soy-related terms: Beverages: UF soy milk. Lecithins: BT Emulsifiers, Phospholipids. UF phosphatidylcholine. Legumes: NT Soybeans. Miso: BT Soy Products. natto: see Soy Products. Sauces: NT Soy Sauces. soy flour: see Soy Products. soy milk: see Beverages; Soy Products.

Soy Products: BT Soybeans, Vegetable Products, Fermented Products. NT Miso, Soy Proteins, Soy Sauces, Soybean Oils. UF natto, nyufu, soy flour, soy milk, sufu, tempeh, tofu, tsukudani, vital.

Soy Proteins: BT Protein Products, Soy Products, Proteins Vegetable. RT Textured Vegetable Proteins. UF okara protein, Promine [Central Soya Co.], Supro 620, yuba.

Soy Sauces: BT Fermented Products, Sauces, Soy Products. UF moromi, shoyu.

Soybean Oils: BT Oils Vegetable, Soy Products. Soybeans (*Glycine max*): BT Legumes, Oilseeds. NT Soy Products.

Note: This is the earliest document seen (Sept. 2003) that is a thesaurus containing terms related to soybeans and soy products. Address: IFIS (International Food Information Service), Lane End House, Shinfield, Reading RG2 9BB, England.

876. *SoyaScan Notes*. 1981. What is thua-nao? (Overview). Oct. 23. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** Thua-nao is a fermented soyfood found mostly in northern Thailand. A close relative of Japanese natto, it is sold or eaten in either of two forms, as cooked thua-nao paste or as thua-nao chips, both of which are made from raw thua-nao paste. Especially popular in areas where fish are scarce, it is used like fermented fish to add flavor to richly-flavored vegetable soups and chili-hot dishes. In some areas it is used as a basic item in the diet rather than merely as a seasoning.

To make thua-nao in the traditional way, 2 to 4 pounds of whole dry soybeans are washed then, without presoaking, boiled in excess water for 3 to 4 hours, or until soft enough to be easily crushed between the fingers. They are then drained, transferred to a bamboo basket lined with banana leaves, covered with additional banana leaves, and allowed to undergo natural fermentation (without special inoculation) at room temperature (86°F or 30°C) for 3 to 4 days, or until they are soft enough to turn into a thick paste when lightly crushed [between] the fingers. As with natto, the fermentation is activated by strains of *Bacillus subtilis* bacteria. The fermented beans or raw thua-nao are

considered to be of good quality when they are covered with a sticky, viscous, colorless material accompanied by a pungent odor of ammonia. The moisture level is typically 62%, the pH 8.4, and the number of bacteria per gram of product 5,200 million. Raw thua-nao is then made into raw thua-nao paste by mashing the former lightly to make a paste then grinding in salt and, in most cases, other flavoring agents such as garlic, onion and red chilies.

To make cooked thua-nao paste, small portions of the raw paste are wrapped in banana leaves and steamed at atmospheric pressure or roasted over an open fire for about 30 minutes. Containing an average of 52.5% moisture and 16.9% protein, the cooked paste will keep for 2 to 3 days.

For longer storage, raw thua-nao paste is formed into small balls each 1 to 1½ inches in diameter, which are pressed to form thin chips and then sun-dried. Containing 17.8% moisture and 36.8% protein, thua-nao chips will keep for about 6 months. The spice and low moisture both contribute to the better keeping quality.

Dr. Malee Sundhagul and colleagues at the Applied Scientific Research Corporation in Bangkok, who have done the pioneering research on thua-nao, have also developed a modern method of preparation. Whole soybeans are soaked overnight in water, drained, and steamed at atmospheric pressure for 2 hours or at 15 pounds pressure for 40 minutes. After being allowed to cool to below 122°F (50°C), they are inoculated with a 1% water suspension of pure culture *Bacillus subtilis* (10 million bacteria per gram of cooked soybeans) or with 10 to 20% by weight of freshly fermented thua-nao beans. Spread in 2-inch-deep-layers in wooden or metal trays and loosely covered with a sheet of plastic, they are incubated at room temperature (30°C) for 36 to 40 hours, or at 35°C for 24 hours, or (as for natto) at 40°C for 20 hours. Finally the fermented beans, spread in thin layers, can be dried at 65°C (150°F) for 24 hours, then ground to make thua-nao powder (also called fermented soy meal) which contains 43.9% protein (one third of which is soluble) and 19.2% fat on a dry weight basis. The production cost of this powder is about one third that of fish meal, Thailand's least expensive animal food protein. The powder has been used to make a low-cost, high-protein food called 'ferm-soy mix' which includes 60% thua-nao powder, 20% fish meal, 6% iodized salt, 4% ground red chilies, 4% garlic powder, and 3% onion powder. The product can be eaten mixed directly into rice or mixed with boiling water to make a sauce or paste.

877. Greenwood, Rebecca. 1981. Irresistible soy cuisine: Discover soy yogurt and prepare old favorites. *East West Journal*. Oct. p. 64, 66-69.

• **Summary:** The author prefers fermented soyfoods, finding them more digestible, and richer in enzymes and vitamins. She describes how to prepare homemade soy viilia (a yogurt-like product whose starter culture is available

from GEM Cultures in Fort Bragg, California), homemade miso, homemade natto and natto condiment, tofu and natto sandwich spread, an autumn meal with natto, amasake, and a pecan pie sweetened with thick amasake. She predicts a bright future for tempeh. Address: Colorado.

878. Wolf, Walter J. 1981. Foreign travel report. Peoria, Illinois. 4 p. Dec. 18. Typed, with signature.

• **Summary:** "Country visited: Japan, Oct. 10-21, 1981. Purpose of trip: (a) Participate in the U.S./Japan Cooperative Program in Natural Resources (UJNR), Protein Resources Panel Meeting; (b) participate in UJNR panel study tour; (c) visit research institutes and industrial laboratories working on soybean proteins; and (d) participate in symposium on soy protein foods. Summary: The UJNR meeting in Tsukuba included 10 presentations by seven Japanese research workers from six different research institutes and three U.S. scientists from three USDA regional research centers. Topics discussed included... (f) single cell protein production from soybean cooking waste waters; (g) soybean storage; (h) food uses of soy protein; and (i) nutritional evaluation of soy proteins. The study tour included a visit to a miso and soy milk factory which was impressive and confirms earlier reports that soy milk has become very popular in Japan in the past 5 years. Visits to industrial laboratories revealed that soy proteins are now used in a large variety of foods. Flavor is one of the last problems holding back development of soy protein-based foods."

The UJNR program, initiated in 1964, plays an important role in implementing the policy of scientific cooperation between the United States and Japan. The protein panel was organized in 1968, and there are now 17 different panels in UJNR.

Dr. Ebine reported that about 790,000 metric tons (29 million bushels) of soybeans are used in traditional Japanese foods—miso, natto, tofu. Organizations visited included Okazaki Marusan Co. Ltd (makes miso, soy milk, and soy yogurt), Research Institute for Food Science of Kyoto University at Uji, Nisshin Oil Mills Ltd., Ajinomoto Co., Inc., Fujipurina Protein Ltd. (Fuji Oil Co. has a joint venture with Ralston Purina Co.). Address: Leader, Meal Products Research, Oilseed Crops Lab., Northern Regional Research Center, Peoria, Illinois 61604.

879. Dronne, Yves. 1981. Le problème mondial du soja [The problem of soybean worldwide]. Paris: Institute National de la Recherche Agronomique. [Fre]\*

• **Summary:** Gives details on Japanese consumption of industrially processed plant proteins (tons/year of defatted soybean meal equivalent): Unfermented: Tofu 84,200, Dried-frozen tofu 22,400, Other products. including texturized soy protein 87,800. Fermented: Soy sauce 173,000, miso 157,400, natto 55,200. Total: 580,000

Concerning Japanese consumption of new "purified"

protein in tons/year. In 1971/1977 total consumption was 27,300/44,000. Of this the amount made from soybeans was 15,900/17,000 and the amount made from wheat gluten was 11,400/27,000. As for the texture, the amount sold in the form of a powder was 17,400/19,600 and the amount sold in textured form was 9,600/24,400.

In 1977, of powdered products, the amount from soybeans was 9,500 (6,000 isolates and 3,500 concentrates) and from gluten 10,100. Of the textured products, the amount from soybeans was 7,500 (6,000 dry extruded, 1,500 moist, and no paste), whereas the amount from gluten was 16,900 (200 dry extruded, 12,000 moist, and 4,700 paste). Address: Paris, France.

880. Kronenberg, H.J. 1981. Synthesis of an antibiotic by *Rhizopus oligosporus*. 14 p. Unpublished manuscript. [9 ref]  
 • **Summary:** “Fermentation products of *Rhizopus oligosporus* were tested for antibiotic activity against *Bacillus subtilis*, *Bacillus subtilis* var. *niger*, and *Sarcina lutea*. A tempeh extract was found to inhibit the growth of all three assay organisms. The antimicrobial compound is moderately heat stable, and there is some evidence suggesting that it may contribute to the nutritional value of soybean tempeh.”  
 Note: *Bacillus subtilis* is the bacterium used in the natto fermentation.

881. Matsui, K.; Fukuda, K.; Kameda, Y. 1981. Chemical modification of amino groups in alanine dehydrogenase from *Bacillus natto* KMD 1126. *Chemical and Pharmaceutical Bulletin* 29:485-89. (Chem. Abst. 94:152584. 1981). \*

882. Ryo, S.; Baba, K. 1981. [Effects of natto (soybean) intake in lactation on the increase of vitamin K in human milk]. *Shusanki Igaku (Perinatal Medicine)* 11:1191-95. (Chem. Abst. 96:5278). [Jap]\*

883. Tikhonova, T.N.; Malyuta, S.S. 1981. [Comparison of transforming DNAs of *Bacillus subtilis* and *Bacillus natto* with respect to their sensitivity to *E. coli* restrictase]. *Tsitologiya i Genetika (Cytology and Genetics)* 15:64-67. (Chem. Abst. 95:57899. 1981). [Rus]\*

884. Aoki, Hiroshi. 1981. Misoshiru sanbai kenkô-hô [Three bowls of miso soup daily for good health]. Tokyo: Goma Books. 220 p. Illust. 20 cm. [Jap]  
 • **Summary:** Miso soups and health recipes. He worked for food companies, including Ajinomoto, for 30 years on development of new soy protein foods. A popularizing book. Discusses Hirayama.

Contents: Preface. Why are miso soups and soyfoods appreciated again now? 1. The many benefits from eating miso soups and soyfoods every day. 2. The Japanese people have forgotten the goodness of miso soups and soyfoods. 3. Healthy soyfoods: From miso to soymilk (miso, natto, shoyu,

tofu, deep-fried tofu pouches, dried-frozen tofu, yuba, okara, roasted whole soy flour or kinako, soymilk, soy oil). 4. Miso soups and soybean cooking make a healthy body. Soybean recipes which are suited to people in the younger generation. Mother’s favorite recipes are good for health, too. Appendix. Maps of Japan showing areas of miso soups and natto.

885. Barber, Linda; Matsuda, Tomoko. 1981. Tôfu, nattô ryôri [Tofu and natto cookery]. Kumamoto City, Kumamoto prefecture (on the island of Kyushu), Japan: Marumiya Co. 25 p. Illust. (color photos). No index. 22 cm. [Jap]

• **Summary:** Contents: Recipes of tofu and natto: 13 western style, 2 Japanese.

Note: A photo shows Linda (left) with co-author,



Tomoko Matsuda; she translated Linda’s recipes into Japanese. She was also Linda’s assistant at Kobe College, and she traveled everywhere that Linda went as a friend and translator. She also helped Linda with food styling.

886. McCallum, Cass. 1981. The real food guide. Vol. 2: Pulses, grains and seeds. Glasgow, Scotland: The Molendinar Press. 196 p. Index. 20 cm.

• **Summary:** The section on “Anti-nutritional factors in pulses” discusses those found in many legumes (such as haemagglutinins, trypsin inhibitors, phytic acid, flatulence factors) and those of importance in specific legumes; for soybeans, only heat-resistant trypsin inhibitors are mentioned. The section on “Basic bean cookery” gives general guidelines and tips (never add salt until beans are cooked tender). A table (p. 54) shows that soybeans require the longest cooking time of any bean listed.

The section titled “A-Z pulses” gives details (incl. the scientific name) concerning many legumes listed alphabetically. Includes adzuki, kura mame [sic, kuro mame = black soybeans] (p. 65), and winged beans. By far the longest section is on soy beans (p. 71-82). Contents: Introduction. Nutritional values. Dried soy bean products: Soy grits, soy coffee, soy flour (full fat, medium fat, fat free), soy nuts, soy milk, soy yolk (a concentrated form of soy flour), textured vegetable protein, soy splits, tofu powder. Fermented soy bean products: Black beans—fermented, chao, chee-fan, chiang (Chinese miso), Hamanatto, ketjap,

koji, meitauza, miso, mame miso, Hatcho miso, kome miso, mugi miso, natto, okara. Soy sauces: Introduction, Chinese soy sauce, ketjap, synthetic sauce, tamari. Sofu [sic, sufu], tahuri, tamari, tao-cho, taokoan or tao koan, taotjo or tao dji [sic, taotjo is Indonesian-style miso; tao dji are Indonesian fermented black soybeans], tempeh, tofu. Tofu from whole beans (homemade recipe). Tofu from powdered [soy] milk.

The part titled "Recipes" (p. 129-92) is divided into three sections. Soy-related recipes in each are listed here: (1) Soups and starters: Iced tofu (p. 134). Miso soup (p. 138). Adzuki bean soup (p. 141). (2) Main dishes: Deep-fried tofu (p. 167). Szechuan bean curd (p. 168). (3) Bread, side dishes, sauces and desserts: Miso lemon sauce (p. 186). Miso ginger sauce (p. 187). Peanut butter (homemade recipe, p. 191).

The rear cover states: "These books fight a war against junk food—and win." The author is a woman.

Note: This is the earliest English-language document seen (Feb. 2004) that uses the word "tao koan" (or "tao-koan") to refer to tofu. Address: United Kingdom.

887. Odunfa, S.A. 1981. Microorganisms associated with fermentation of African locust bean (*Parkia filicoidea*) during iru preparation. *J. of Plant Foods* 3(4):245-50. [13 ref]\*

• **Summary:** Soybeans are mentioned several of times on page 249 in reference to the fermentation of soybean to produce natto or iru. Soybean is in the titles of two of the references listed on page 250.

Note: This is earliest document seen (Jan. 2012) in which S.A. Odunfa of Ibadan, Nigeria, writes about iru (dawadawa). Address: Dep. of Botany & Microbiology, Univ. of Ibadan, Nigeria.

888. *SoyaScan Notes*. 1981. When were small-seeded soybean varieties bred specifically for making natto first released or licensed, and by whom? (Overview). Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** 1915–*Ko-tsubu-daizu* ["small-seeded soybean"]. "40112. No. 7... used for *miso* and *natto*." Received 8 March 1915 'From an exhibition in Kawamata, near Fukushima City.' Source: USDA Bureau of Plant Industry, Inventory. 1918. "Seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from January 1 to March 31, 1915. Nos. 39682 to 40388." No. 42. 123 p. April 17. See p. 69.

Traditional–Jizuka. Smallest, from Ibaraki prefecture. Source: Ontario Soya-Bean Growers' Marketing Board. 1982. "Canadian soyabean mission, South East Asia, Feb. 12th–27th, 1982: Mission member reports." Chatham, Ontario: Ontario Soya-Bean Growers' Marketing Board. 12 p. Feb.

Traditional–Suzuhime. Small, from Hokkaido. Source: Ontario Soya-Bean Growers' Marketing Board. 1982. "Canadian soyabean mission, South East Asia, Feb. 12th–

27th, 1982: Mission member reports." Chatham, Ontario: Ontario Soya-Bean Growers' Marketing Board. 12 p. Feb.

Traditional -

1981–Nattawa. MG-0. Developed by Agriculture Canada, Ottawa. Source: Richard Bernard 1992. "Additions to Table 6 of USDA Technical Bulletin 1746."

1981–Hartz 936X. MG-6. Sources: Griffis and Widermann. 1992. *Ibid.* p. 6.

1983–Chico. MG-00. Source: Griffis, Gil; Wiedermann, Lars. 1992. "Marketing food-quality soybeans in Japan: A manual on how to profit from the niche market in Japan for value-added soybeans. 5th ed." St. Louis, Missouri: United Soybean Board. 25 p. (Report). See p. 5-6.

1985–Canatto. MG-000. Developed by Agriculture Canada, Ottawa. Source: Richard Bernard 1992. "Additions to Table 6 of USDA Technical Bulletin 1746."

1985–King Natto. MG1. Sources: Griffis and Widermann. 1992. *Ibid.*

1986–Nattoking 86. Developed in Canada by N.R. Bradner of King Grain. Source: Beversdorf, W.D.; Buzzell, R.I.; Ablett, G.R.; Voldeng, H.D. 1995. "Soybean." In: A.E. Slinkard and Douglas R. Knott, eds. 1995. *Harvest of Gold: The History of Field Crop Breeding in Canada*. Saskatoon, Saskatchewan: University Extension Press, Univ. of Saskatchewan. ix + 367 p. See p. 153-66. Chap. 13. See p. 9.

1986–Vance. MG-V. Sources: (1) Griffis and Widermann. 1992. *Ibid.* (2) University of Illinois, Dep. of Agronomy. 1993. "USDA Soybean Germplasm Collection: Public varieties (United States and Canada)." Urbana, Illinois. 3 p. Feb. 16. Unpublished typescript. Beversdorf, W.D.; Buzzell, R.I.; Ablett, G.R.; Voldeng, H.D. 1995. "Soybean." In: A.E. Slinkard and Douglas R. Knott, eds. 1995. *Harvest of Gold: The History of Field Crop Breeding in Canada*. Saskatoon, Saskatchewan: University Extension Press, Univ. of Saskatchewan. ix + 367 p. See p. 153-66. Chap. 13.

1987–Nattoking 87. Developed in Canada by N.R. Bradner of King Grain. Source: Beversdorf et al. 1995, p. 9

1988–NattoKing K87, Nattoking 88. MG-1. Developed in Canada by N.R. Bradner of King Grain. Source: Beversdorf et al. 1995, p. 9. Griffis & Widermann. 1992. *Ibid.*

1989–Camp. MG-V. Developed by Virginia Agricultural Experiment Station. Source: Richard Bernard 1992.

"Additions to Table 6 of USDA Technical Bulletin 1746."

1989–IL1 and IL2. Developed by University of Illinois Agricultural Experiment Station. University of Illinois, Dep. of Agronomy. 1993. "USDA Soybean Germplasm Collection: Public varieties (United States and Canada)." Urbana, Illinois. 3 p. Feb. 16. Unpublished typescript.

1989–Minnatto. MG-0. Developed by Minnesota Agricultural Experiment Station. Source: Richard Bernard 1992. "Additions to Table 6 of USDA Technical Bulletin 1746."

1989–Nattosan. MG-0. Developed by Agriculture Canada, Ottawa. Source: Richard Bernard 1992. “Additions to Table 6 of USDA Technical Bulletin 1746.”

1989–Hartz 914 and Hartz 922. MG-6. Sources: Griffis and Widemann. 1992. *Ibid.* p. 6.

1989–SS201 and SS202. Developed at Iowa Agricultural Experiment Station. Bernard, Richard L. 1999. “Summary of research & breeding programs for food type soybeans.” Urbana, Illinois. 3 p. Feb. Unpublished typescript.

1989–Suzumaru [Suzu-maru]. Developed by the Hokkaido Central Agricultural Experiment Station, Hokkaido, Japan. Sources: (1) Biological Abstracts, Vol. 87. No. 9. It yielded 30.9 tonnes per hectare on average in performance tests during 1984-1987. (2) Hosoi, Tomohiro; Kiuchi, Kan. 2003. “Natto—A food made by fermenting cooked soybeans with *Bacillus subtilis* (natto).” In: Edward R. Farnworth. 2003. *Handbook of Fermented Functional Foods*. Boca Raton, Florida: CRC Press. 390 p. See p. 227-50. Natto makers prefer to use certain soybean varieties such as Suzuhime and Suzumaru which are grown in Hokkaido, Kosuzu in Iwate, Miyagi, and Akita Prefectures, and Natto-Shoryo [= Natto-kotsubu] in Ibaraki Prefecture. These Japanese cultivars are registered with the Ministry of Agriculture, Forestry and Fisheries (MAFF).

1989–TNS. Developed in Canada by Harvey Voldeng at CES in Ottawa. Sources: (1) Source: Beversdorf et al. 1995, p. 9. (2) Bernard, Richard L. 1999. *Ibid.*

1989–Vanatto. Developed in Virginia, USA. Source: Chowning, Larry S. 1989. “Soybean marketing efforts in Japan earn state honor for local farming operation.” *Southside Sentinel* (Urbanna, Virginia). Feb. 2. Recently, Montague Farms (owned by Bill Taliaferro of Center Cross in Essex County) introduced Vanatto (which stands for Virginia Natto), a brand of Virginia-grown soybeans for the specific purpose of making natto. For nearly 5 years, the Taliaferros worked to develop the market in Japan, knocking on doors. “Since establishing the market in Japan, the Taliaferros have over 40 growers in Maryland and Virginia growing the small variety of soybean used to make natto.

1994–Pearl. Developed by Thomas Carter, USDA plant breeder stationed at North Carolina State University (NCU). Pearl is adapted to North Carolina growing conditions. Source: *Seed World*. 1994. “Soybean tailored to natto market.” June. p. 58.

1995–Danatto. Bernard, Richard L. 1999. *Ibid.*

Pureunkong–1997. Plant Breeding Abstracts, Vol. 67 states: Pureunkong was selected from the cross between the local cultivar Chungsaek- namulkong (green seed coat) and L78-379 made in 1982.

2003–Natto-Shoryu. Grown in Ibaraki Prefecture. Source: Hosoi and Kiuchi, 2003.

Date unknown–Chohakuzan. Bernard, Richard L. 1999. *Ibid.* Chohakuzan is a small-seeded parent used for breeding natto-type soybeans. Address: Founder, Soyinfo Center,

Lafayette, California.

889. Teraoka, Hisayuki; Morii, F.; Kobayashi, J. 1981. Shokuhin-chû ni fukumareru 24 shu no genso ryô oyobi ichi nichi no genso sesshu-ryô ni tsuite [The concentrations of 24 elements in foodstuffs and the estimate of their daily intake]. *Eiyo to Shokuryo (J. of Japanese Society of Food and Nutrition)* 34(3):221-39. See p. 232-35. [Jap]

• **Summary:** The 24 chemical elements whose concentrations are given are: potassium (K), phosphorus (P), magnesium (Mg), calcium (Ca), sodium (Na), iron (Fe), silicon (Si), zinc (Zn), manganese (Mn), aluminum (Al), copper (Cu), boron (B), strontium (Sr), lead (Pb), titanium (Ti), barium (Ba), nickel (Ni), vanadium (V), molybdenum (Mo), silver (Ag), cadmium (Cd), cobalt (Co), tin (Sn), and chromium (Cr).

Concentrations (in micrograms per 100 gm) of these elements were measured in the following soyfoods:

Soybeans 1,200, tofu (momen/regular) 410 (average of 2 samples), tofu (natural foods, probably made with nigari) 280, tofu (kinugoshi/silken) 280, and natto 770.

These aluminum concentrations were about average compared with the other foods tested. Examples of foods with much higher aluminum concentrations were: kombu seaweed 33,000, tsukushi (a vegetable) 22,000, white sesame seeds 4,400.

Note: This is the earliest document seen (Aug. 2002) that gives the concentration of aluminum in soybeans or soyfoods. Address: Inst. for Agricultural and Biological Sciences, Okayama Univ., Kurashiki, Okayama, Japan.

890. Ichishima, Eiji; Kato, M.; Wada, Y.; Kakiuchi, H.; Takeuchi, M.; Takahashi, T.; Takimami, K.; Hirose, Y. 1982. Spore fatty acid composition in *Bacillus natto*, a food microorganism. *Food Chemistry* 8(1):1-9. Jan. [23 ref. Eng]

• **Summary:** Natto is a popular and economical fermented food in Japan. In 1976, 124,000 metric tons (tonnes) of natto were produced. The growth of *Bacillus natto* on the surface of natto soybeans creates compounds that are parts of its characteristic tastes and flavors, such as tetramethylpyrazine. Address: 1-6. Dep. of Agricultural and Biological Chemistry, Tokyo Noko Univ., Fuchu, Tokyo 183, Japan; 7-8. Central Research Labs., Ajinomoto Co., Inc., Suzukicho, Kawasaki 220, Japan.

891. Taira, Harue; Katoh, Kazuhisa; Okazaki, Koichiro; Ishida, Shigeki; Kawasaki, Yoshihiro; Shimokawara, Hiroshi; Takei, Reiko; Kikuchi, Syoko; Murakami, Shunichiro; Okubo, Soichiro. 1982. Daizu shijitsu no kansô shori hôhō to sono hinshitsu ni tsuite. VI. Tei-suibun ganryô shijitsu no futsûgata konbain shûkaku-kansô shori ga shijitsu no kakô tekisei oyobi tôfu, nattô no kôjô seizô shiken ni oyobosu eikyô [Influence of dry treatment after harvest on quality of soybean seeds. VI. Influence of combine harvesting and drying of low moisture seed on qualities for soybean food

processing and tests for factory production of tofu and natto]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 39. p. 23-31. Jan. [7 ref. Jap; eng]

• **Summary:** Two harvesting methods and 4 drying methods were tested with the middle-sized seed variety Kitamishiro (Table 1). Address: 1. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 2-4. Hokkaido National Agric. Exp. Station, Memuro, Hokkaido, Japan.

892. Wollner, Joel. 1982. History of Erewhon, macrobiotics, and soyfoods in America (Interview). Conducted by William Shurtleff of Soyfoods Center, Feb. 2. 2 p. transcript.

• **Summary:** Evan Root was the first attendant at the Erewhon retail store, below street level at 303-B Newbury Street. He lacquered the walls with Michio. Evan is a great storyteller, very intelligent. The initial store was just one room, about 10 by 20 feet. Very few people came in to buy food, so it was more like a stock room than a store. Some evenings there were lectures there. Redwing Books now occupies that space. Most of the food (a tin of miso, a keg of tamari) was just being sent by the Kushis' friends from Japan as gifts; it didn't go through customs.

The Kushis got nigari and made tofu at home. It was not for sale, but for dinner guests and cooking classes. Joel made some tofu using lemon juice when nigari was not available.

As tofu started to become more popular, Erewhon started to buy it from a tofu maker in Boston's Chinatown. First they just bought and sold that tofu, but before long (in about 1973-74) they convinced him to start making nigari tofu for them. They guaranteed to buy what he made, and they sold him the nigari at cost. This might have been the first nigari tofu made in USA. A lot of nigari tofu is still made in Boston's Chinatown. Joel thinks the tofu maker was located on Tyler, Street, perhaps Yah Kee. Nigari came in 66 pound sacks from Japan. Erewhon also sold small quantities of nigari in the retail store. Chinatown was Erewhon's main source of tofu until Laughing Grasshopper appeared.

What was the macrobiotic movement's contribution to the history of soyfoods in the United States? Macrobiotic teachers and students talked and wrote about them, ate them, and sold them. They felt soyfoods were an important part of a good diet. They educated people and developed a market for soyfoods. Few Americans had eaten miso and tofu at home before 1966—the year Erewhon started. Macrobiotics were the first Caucasian Americans to really use soyfoods regularly. Before that, soyfoods (except perhaps soy sauce) were just interesting oddities. Once could say that the macrobiotic movement introduced soyfoods to America.

As for tofu, Joel thinks that Michio Kushi's students misinterpreted his remarks about tofu being yin. Macrobiotics now eat tofu regularly, 3-4 times a week. There are endless ways to prepare it. It's been years since Joel has

heard that tofu is “too yin.”

What did *The Book of Tofu* (published in Dec. 1975) do for tofu? It expanded its relevance for the Western diet. Before that book, most of the tofu in the United States was consumed by people of East Asian ancestry.

Charles Kendall played a key role in making and introducing natto, mochi, and amazake to Caucasian Americans. He made these foods in his home and sold them locally. Initially, it was not a formal / legal business. But today his business, Kendall Foods, sells \$500 a week of these three foods. He has been making natto for 4-5 years. He was America's first Caucasian natto maker. Natto was served in macrobiotic restaurants in Boston.

The latest soyfood to hit Boston has been tempeh. It's been a phenomenal success. Macrobiotics are going crazy over it. Thom Leonard has been giving lots of tempeh classes for the past 1½ years. For more than a year, lots of sandwich makers in Boston have been making and selling tempeh sandwiches. Tempeh is made into cutlets, burgers, tempeh mock-tuna salad. Why is it so popular? Because it is rich and meaty in texture and flavor—the opposite of rice. Most macrobiotics crave rich, meaty foods.

Ron Kotsch is very close to the Kushis. A very unpretentious person with a wonderful sense of humor, he is now teaching in North Carolina. He is friends with Helen and Scott Nearing. He toured China and Japan with John Denver, the singer and songwriter—who did a benefit for Michio's new college.

How does Joes see the future of Erewhon? He thinks the company will focus on manufacturing only. Now is the critical time. He'd give Erewhon a 30-70% chance of survival. Address: Boston, Massachusetts.

893. Kanno, Akishige; Takamatsu, H.; Takano, N.; Akimoto, T. 1982. Nattô ni kansuru kenkyû. I. Nattô seizô kôtei ni okeru toseibun no dôkô [Studies on natto. I. Change of saccharides in soybeans during manufacturing of natto]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society for Food Science and Technology)* 29(2):105-10. Feb. (Chem. Abst. 96:161110). [29 ref. Jap; eng] Address: Asahi Shokuhin Co. Ltd., 180-2 Wado, Ushibori-machi, Namekata-gun, Ibaraki-ken, 311-24 Japan.

894. Ontario Soya-Bean Growers' Marketing Board. 1982. “Canadian soyabean mission, South East Asia, Feb. 12th–27th, 1982: Mission member reports.” 1982. Canadian soyabean mission, South East Asia, Feb. 12th–27th, 1982: Mission member reports. Chatham, Ontario: Ontario Soya-Bean Growers' Marketing Board. 12 p. Feb. 12 p. Feb. 24 x 11 cm. [Eng]

• **Summary:** Contents: Comments, by Peter H. Epp, Chairman. Japan: Home Shokuhin Tofu Manufacturing Co., Komatsuya Shokuhin (natto mfg. plant), Nihon Miso (manufacturing plant), Japan Miso Assoc., Japan



Tofu Assoc., Federation of Japan Natto Manufacturers' Cooperative Society, Wako Shokuryo Co. (makes natto; Jacob Hartz in Arkansas supplies them with "936X" variety small-sized natto soybeans; Wako also supplies Nihon Miso Mfg. Plant), X-Can Far East Ltd. Korea: Seoul meeting at embassy, Chung's Food Ltd., Agriculture and Fisheries Development Corp., Korean Soybean Curd Cooperative Manufacturing Assoc. Singapore: Okura & Company Ltd., Eng Huat Pte. Ltd., Intraco. Malaysia: Yeo Hiap Seng Co. Ltd. (the largest manufacturer of soymilk in Malaysia and Singapore). Follow-up. Conclusion.

Each of the following members of the mission wrote a chapter in this book, discussing each visit mentioned in the contents: Peter H. Epp, Bernard Calhoun, Otis McGregor, Richard I. Buzzell, M.D. Pennell (General Manager, R&D, H.J. Heinz Company of Canada Ltd.), Michael Loh (Export Development Specialist, Ontario Ministry of Agriculture and Food).

Details are given on the soybean characteristics desired for each type of soyfood product, especially in the chapter by Dr. Buzzell. Popular soybean varieties include: For Miso: Enlei [Enrei], Fujimejiro, Harcor.

For natto: The main natto specifications are: 1. Seed size—small but fully developed, less than 5.0 mm diameter if possible. 2. Round seed. 3. Total sugar content < 22%. 4. Oil content > 19%. 5. White / yellow hilum. Best natto varieties: Jizuka (the smallest, from Ibaraki prefecture) and Suzuhime (small, from Hokkaido), "two domestic [Japanese] varieties used for superior quality natto, were priced at \$100 U.S. for 60 kg. The U.S. varieties which have been, and are being used presently, are not satisfactory. Both Nattawa and Pioneer 1677 varieties should adapt well to the natto product." Jennett (H24) from the USA is good. (p. 5, "Natto specifications Japan, unnumbered page near rear).

For tofu: Amsoy, Coles, Harcor.

Letter from Fred Brandenburg of OSGMB. 1994. Nov. 9. "Regarding export promotion before 1982, any activities would have been part of larger government sponsored trade missions. For example, in 1979 Otis McGregor participated in a mission to Asia which was co-ordinated by Michael Loh. It included a number of marketing boards and associations from Canada."

Note: This is the earliest document seen (Dec. 1998) that (apparently) mentions the soybean variety Enrei. Address: P.O. Box 1199, Chatham, ONT N7M 5L8, Canada. Phone: 519-352-7730.

895. Suzuki, Hiroshi. 1982. Daizu kakô shokuhin no hinshitsu [Quality of processed soybean foods]. *Nyu Fudo Indasutori (New Food Industry)* 24(2):42-49. Feb. [2 ref. Jap]

• **Summary:** Discusses mostly natto and tofu. This journal is published by the Tokyo Metropolitan Agric. Exp. Station. Address: Tokyo-to Nogyo Shikenjo.

896. Welters, Sjon. 1982. Re: Recent developments with soyfoods in Europe, and ties with macrobiotics. Letter to William Shurtleff at Soyfoods Center, April 16. 6 p. Typed, with signature on letterhead (photocopy).

• **Summary:** This letter, whose letterhead reads "Manna Natuurlijke Levensmiddelen," contains names and addresses of many new soyfoods companies, many of them started by people interested in macrobiotics. Names and addresses of the following companies are given: Tofu Denmark (in Valby, run by Per Fruergaard, a macrobiotic), Bernard Storup, Ab & Paulien Schaft (Dutch, setting up a small shop in Baillestavy, France, to make miso, shoyu, natto, and koji), Traditions du Grain (Jean Luc Alonso is setting up a macrobiotic tempeh shop in Ivry France; they will start this summer), Paul Jones (Tofu shop in London), Saskia de Jong (may make miso in Ireland), de Brandnetel (tofu shop in Antwerp, Belgium), Jonathan (makes tofu, ganmo, seitan, mochi in Ekeren, Belgium. Run by J. v. Ponselee), Seven Arrows (Leuven, Netherlands; making tofu), Lima Foods (now sell miso made at their plant and farm in France), Witte Wonder (Den Haag, Netherlands), De Morgenstond (Bakkeveen, Netherlands), Jakso (Heerwaarden, Netherlands. Run by Peter Dekker. The first and only shop making tempeh from organic soybeans), Firma Lembekker (Amsterdam), Unimave (Lisbon, Portugal), Jose Parracho (Setubal, Portugal), Swame [sic, Swami] Anand Svadesha (Furth im Wald, West Germany), Bittersuess (Cologne, West Germany. Attn: Thomas Kasas/Karas). Three distributors of soyfoods and natural foods in Germany are YinYang (Berlin), Rapunzel (Heimraadshofe), and Mutter Erde (Werbelen). In Finland: Luonnonruokakauppa AUMA (Helsinki). In Switzerland: Verena Krieger of Sojalade (Engelberg, tofu shop), Hans Rudolph Opplinger (Cham, tofu shop), Marty Halsley (Nyon, tofu & tempeh), Restaurant Sesam (Bern). P. Ton van Oers is a Dutch priest who works in Kananga, Zaire. The natives have grown soya for 10 years and he is thinking of making tofu and soymilk from them.

"In Great Britain the East West Centre is very active in promoting soyfoods. As a part of the Kushi Institute program they have home-scale processing, in which tofu, tempeh, and miso-making are taught by Jon Sandler [Sandifer?]. He is the tempehmaker of the EWC too at Community Health Foundation, 188 Old St., London EC1. In the Netherlands, a great deal of soyfoods promotion is done by the East West Center and Manna. As you probably know, Manna was the first to introduce miso, tamari, shoyu, tempeh, tofu and koji to the larger public and we are still the main promoters of soyfoods as part of a more natural, vegetarian, and economic diet. Manna has been followed by a lot of other distributors of natural and health foods. We have two competitors in the tofu business: Witte Wonder and De Morgenstond.

"At the moment I'm the only teacher giving lectures on homescale miso-, tofu-, tempeh-, shoyu-, tamari-, natto-,

and koji-making in the Netherlands. Mainly at the East West Centre and sometimes at different places in the country. People are starting to get interested.”

Note: This is the earliest document seen (Jan. 2003) concerning the work of Swami Anand Svadesha of West Germany, and of Thomas Karas of Bittersuess (Cologne, West Germany). Address: Stichting Natuurvoeding Amsterdam, Meeuwenlaan 70, 1021 JK Amsterdam-N, Netherlands. Phone: 020-323977.

897. Hara, T.; Fujio, Y.; Ueda, S. 1982. Polyglutamate production of *Bacillus subtilis* (natto). *J. of Applied Biochemistry* 4(2):112-120. April. [26 ref]\*

• **Summary:** Mechanism of formation of viscous material of “natto” using DNA transformation as a genetic technique, growing on steamed soybeans. Address: Japan.

898. **Product Name:** [Tempeh, Tofu, and Natto].

**Manufacturer’s Name:** Soy Joy.

**Manufacturer’s Address:** Chemin de la Prelaz 1, CH-1260 Nyon, Switzerland. Phone: 022-61-9312.

**Date of Introduction:** 1982. April.

**New Product–Documentation:** Soyfoods Center Computerized Mailing List. 1982. July 23. Owner: Marty Halsey. Form filled out by Martin Halsey ca. 1982. Company opened in April 1982. His initial products were tempeh, tofu, and natto. “Working on miso. Supplying macrobiotic community on a small scale.”

Note: This is the earliest known commercial natto manufacturer in Europe.

Letter from Sjon Welters. 1982. April 16. Gives his home address as c/o Costello, Mafroi 6bis, 1260 Nyon, Switzerland. He is “An American sportsman who started a small tofu and tempeh shop.”

R. Leviton. 1983. Report on trip to Europe with American Soybean Assoc. Oct-Nov. p. 17. Marty Halsey [sic, Halsey] makes 200 kg/week of tofu, plus some handmade tempeh.

899. Watanabe, Atsuo; Ohtani, Toshio; Nikkuni, Sayuki; Baba, Tohru; Ohta, Teruo. 1982. [The efficacy of ultrafiltration treatment of the drained water from steaming of soybeans in natto processing]. *Nippon Shokuhin Kogyo Gakkaishi* (*J. of the Japanese Society for Food Science and Technology*) 29(4):245-49. April. [7 ref. Jap; eng]\* Address: 1-3, 5. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukubagun, Ibaraki-ken 305, Japan; 4. Kagoshima State Lab. of Agriculture.

900. Watanabe, A.; Ohtani, T.; Nikkuni, S.; Baba, T.; Ohta, T. 1982. [Operating condition of ultrafiltration of the drained water from steaming of soybeans in natto processing]. *Nippon Shokuhin Kogyo Gakkaishi* (*J. of the Japanese*

*Society for Food Science and Technology*) 29(4):250-54. April. [4 ref. Jap; eng]\*

901. Parker, Joyce. 1982. Soyfoods and soybeans in Nepal (Interview). Conducted by William Shurtleff of Soyfoods Center, May 17. 1 p. transcript.

• **Summary:** Tofu is made in Kathmandu, but on a very small scale. Soybeans (*bhatmas* in Nepali) are used as food in various ways in various parts of Nepal. In Eastern Nepal, they are used mostly as a snack (*khaajaa*) served with early afternoon tea. The snack is called *bhatmas ani chiura* (“soybeans and beaten rice”). To make it: Roast dry soybeans in a dry, well-seasoned, heavy cast iron wok over an open hearth for 5-10 minutes, stirring constantly, until nicely browned but with no burned beans. Run through a hand-turned stone mill to just split the soybeans into halves. In the wok, heat mustard oil (*mattitel*) and heat until the smoke rises. Then add minced green onion, chili pepper, and gingerroot. Stir fry until the soybeans are enrobed with the mixture, salt lightly, then stir over beaten rice [also called flattened rice; dehusked rice which is flattened into light dry flakes]. It is delicious and crunchy.

In Nepal, soybeans are usually grown as companion plants with corn or along the borders of irrigated fields. A British AID agricultural farm [Agricultural Research Station] at Pakhribas has developed soybean varieties for different terrains.

Kinema, a fermented soyfood, is a good trekking food. Nepalese make a soup of it and pour it over rice. It keeps well and is easy to cook. To make kinema, boil soybeans until they are soft, then grind to a mush with a local mortar and pestle. Mix in the ash of any type of wood and place the mixture in a shallow bamboo basket (*dhahi*), cover and leave for 24 hours. Then remove and sun dry.

Note: This is the earliest document seen (Dec. 2011) that uses the word “kinema” to refer to this fermented soyfood from Nepal; it is a close relative of Japanese natto. Address: Peace Corps volunteer, Nepal.

902. Pautz, Jane Abe Cadwell. 1982. Re: Directory of soyfoods manufacturers in Sao Paulo, Brazil, and comments on the availability of these foods. Letter to William Shurtleff at Soyfoods Center, May 29. 3 p. Typed.

• **Summary:** List all known companies in Sao Paulo that make soyfood products. A separate listing is given for each product with the full company name and address. The product categories include: Tofu and tofu products (2 companies). Soymilk (4). Shoyu (3). Sellers of whole dry soybeans (1). Lecithin (1). Soyflour (1; soyflour is available in many stores without a brand name). TSP / TVP (2).

“As you know we have a large Japanese colony here in the country. I am only aware of what is here in Sao Paulo.”

“Soynuts are available in health food stores in small unlabeled packages. I have not seen soy nut butter. Misso

(miso) is plentiful. Soy sprouts are sometimes available in open-air markets along with other Japanese products. They aren't common. Fresh green soybeans [edamamé] are also available at certain times of the year in these markets. Of course there is lots of soyoil. I think that Sanbra is one of the big producers or sales company of the beans [soybeans]. In some of the healthfood stores there is a product available called 'carne de soja' (literally "soy meat [textured soy flour]). There is no brand name and I have not experimented with it."

"I will be working on a book of tofu recipes during this vacation. The publisher wants to publish it yet this year.

"Last year I gave 3 lessons in working with soyfoods at the Nestlé experimental kitchen here in Sao Paulo, and may be working with a new health foods store / restaurant in developing foods. I would like to see them try some typical soy-deli kinds of things. There is a lot of interest here, new stores of 'produtos naturais' and vegetarian restaurants are quite popular." Address: Rua Spinagés 1974 Apto. 61, 01258 Sao Paulo, Brazil.

903. Leviton, Richard. 1982. Discovering Japanese soyfoods. *Vegetarian Times* No. 57. May. p. 60-62, 65. [1 ref]

• **Summary:** Recently Richard Leviton traveled to Japan with a group of Americans to get a firsthand look at the Japanese soyfoods industry. There he got his first look at the fabled neighborhood corner tofu shop. He discusses tofu (the Japanese consume 10 million cakes a day) and tofu manufacturers (large and small), types of tofu include silken tofu (called kinugoshi), fresh soft tofu called momen. "In the typical supermarket we counted as many as 60 different soyfood items (often several brands or product sizes), ranging from fresh miso and tofu to packaged soymilk and shoyu, natto, dried frozen tofu, yuba rolls and kinako powder."

Also: Takatsuka Marugo (a large tofu maker that churns out 100,000 lb/day of tofu), Yuba Han (a traditional yuba shop in Kyoto), Asahimatsu Kori-dofu Co., natto, Hamanatto, soymilk, cooked soybeans with wakame, soy sprouts, kinako powder, packaged green soybeans in the pods, miso (fresh and freeze-dried), Linda Barber (an American home economist who is teaching at Kobe Girl's College in Nishinomiya, and also teaching American-style tofu recipes to Japanese housewives via television and the print media), and Sasa-no-Yuki, a 279-year old restaurant that specializes in tofu cookery.

Photos show: (1) Eleven different tofu dishes in bowls as served at Sasa-no-Yuki restaurant in Tokyo. (2) A man hanging up fresh yuba at Yuba Han. (3) Members of the group seated on tatami mats on the floor around a huge table enjoying dishes served at Sasa-no-Yuki. Address: 100 Heath Rd., Colrain, Massachusetts 01340. Phone: 413-624-5591.

904. Yamauchi, Shoan. 1982. History of Matsuda-Hinode

Tofu Co. (Interview). *SoyaScan Notes*. June 29 and Aug. 11. Conducted by William Shurtleff of Soyfoods Center. Then two follow-up interviews in Oct. 1988.

• **Summary:** The company traces its roots back to Hawaii to the Uyeda/Ueda Tofu Co., which may have started at an earlier date. In 1939 Mr. and Mrs. Shokin Yamauchi, who had 6 (8??) children and very little money (the effects of the Depression were still being felt), bought Uyeda/Ueda Tofu Co. on Aala Street from Mr. and Mrs. Uyeda/Ueda, who had bought it 2-3 years earlier from someone else. It was a very small mom and pop operation. Two friends of the family, one an uncle, helped the Yamauchi family to buy the company. Either shortly before or shortly after the Yamauchi family bought the business, it was renamed Aala Tofu Co. It was never named Shoan Yamauchi Tofu, the name that appears in a 1942 Honolulu City Directory. Mrs. Yamauchi and her two sons, Shoan (the #2 son, who had previously baked cakes in a bakery) and Shojin (the #3 son, who was still in high school), ran the family business successfully. Shoan, who learned how to make tofu from Mr. Ueda, the eldest son did most of the work. He recalls: "I worked like a dog, 15-16 hours a day, 7 days a week, for no pay and with almost no help from machines." Shoan's father did other work in the shipyards. In 1942 Shoan married Shizuko ??, who also lived in Hawaii. She joined him working at the tofu shop.

After World War II, in 1946, on his younger brother's recommendation, Shoan went to Los Angeles. The Japanese were just coming out of the wartime intern camps, many having lost everything. First he talked to the five partners at Matsuda Tofu Co., which had about 5,000 square feet versus 700 square feet for Hinode, but Matsuda didn't want to sell? What did they say? So 1946, Shoan gave the family tofu shop in Hawaii to his brother, Shojin, and in September 1947 he and his wife moved to the mainland. Before buying a business?? The owners of the Hinode Tofu Co. in Los Angeles offered to him their company for \$4,000; it had cost them \$8,000 to set it up. Shoan decided to buy it, even though his wife didn't want to.

A little background on tofu in Los Angeles. The two early tofu companies were Japanese-run Matsuda and Chinese-run Wing Chong Lung. Both had started in about the 1920s (or perhaps before) in Los Angeles.

Matsuda Tofu Co. was started in about 1920 by a Mr. Matsuda. During World War II the company was closed. Mr. Matsuda and his workers were sent to intern camps. After the war, 5 partners (including Ken Osaki and a Mr. Sasaki), who had very little money, obtained the Matsuda name from Mr. Matsuda and essentially started a new company. They had to move the business to a new location, probably because of zoning problems.

Shortly after the war a new company named Tomoi Tofu Co. was established in Los Angeles at First and San Pedro Streets. But they were bought out by Matsuda in 1946 for \$8,000. Thereafter, having no competition, Matsuda raised

prices and there was a furor among consumers. So the former owners of Tomoe (Mr. Tomoe and probably a partner) started Hinode Tofu Co. in March 1947 at 6th St. and Towne Ave. They made 1,500 cakes of tofu a day.

Then the owner of Tomoe Tofu Co. got sick. Shoan Yamauchi's younger brother, Shojin ("Jin"), had visited Hinode in May 1946, then returned to Hawaii and told Shoan to go to Los Angeles, as described above.

In November 1947 Shoan and Shizuko began to run Hinode Tofu Co. at 6th St. and Towne Ave. They made only three products: Japanese-style soft and Chinese-style firm tofu, plus agé (deep-fried tofu pouches). The early years were tough; it was a small company with no reputation, and almost no machinery or capitalization. The tofu wholesaled for \$0.20/lb and was sold only in bulk. Again the work was hard and the hours long. In 1952-53 he moved the business to 4th St. and Towne Ave (Why??), where he bought his own building. Most of Mr. Yamauchi's customers were Chinese and Japanese, with very few Caucasians. Hinode Tofu Co. grew steadily, and in 1956 Mr. Yamauchi bought out his competitor, Matsuda Tofu Co., the only other Japanese tofu maker in the area. The new company, named Matsuda-Hinode Tofu Mfg. Co. was now the biggest on the mainland United States. In 1964 (1962) the company established three milestones: (1) It became the first company on the West Coast (and perhaps in the world) to package tofu; (2) It became the first U.S. company to get tofu into a supermarket chain (Boy's Market in Los Angeles); and (3) It became the first U.S. company to make natto.

In 1969 the company built and moved into its present location at 526 S. Stanford Ave. That same year the company introduced several new tofu products that Yamauchi had learned to make in Hawaii, which were not yet widely made on the mainland: Kinugoshi (silken) tofu, nama agé (deep-fried tofu cutlets), and yaki-dofu (grilled tofu).

In about 1976 he added ganmodoki (deep-fried tofu burgers). In 1978 the company expanded into a million-dollar automated factory, which made the first pasteurized tofu in the western world. In 1981 the company's name was shortened to the original name, Hinode Tofu Co. That year tofu production was 81,000 pounds a week, rising to an estimated 140,000 lb/week in 1982—27% more than the next largest tofu manufacturer in the western world, Azumaya.

Mr. and Mrs. Yamauchi have three children, all adopted. John Yamauchi, the second oldest, is very involved with the tofu business. Rodney does sprouts. Address: 526 S. Stanford Ave., Los Angeles, California.

905. Shurtleff, William; Aoyagi, Akiko. 1982. Soyfoods industry: directory and databook. 2nd ed. Lafayette, California: Soyfoods Center. 56 p. June. 28 cm. [24 ref]

• **Summary:** A detailed study of the rapidly emerging soyfoods industry and market. Contains original statistics compiled by the Soyfoods Center through interviews with

companies. Contents: 1. Terminology: The many types of soyfoods. I. Traditional low-technology soyfoods. 1A—Nonfermented soyfoods: Fresh green soybeans, whole dry soybeans, soynuts and soynut butter, soy sprouts, whole soy flour & grits, roasted soy flour [kinako] & soy coffee, soymilk and dairylike soymilk products, tofu (eight types), okara or soy pulp, yuba.

1B—Fermented soyfoods: Tempeh, miso, soy sauce, shoyu & tamari, natto & thua-nao, fermented tofu & soymilk, soy nuggets (Hamanatto & tou-ch'ih).

II. Modern soy protein foods: Defatted soy flour, grits & flakes, soy protein concentrates, textured soy protein products, soy protein isolates.

III. Soy oil products: Soy salad oil & cooking oil, soy oil margarine & shortening, soy lecithin.

2. Soyfoods industry directory: Names and addresses of over 850 soyfoods manufacturers in the Western world, plus major soymilk, miso, shoyu, and yuba manufacturers in East Asia. 3. Analysis of the soyfoods industry in the U.S.

4. Trends in U.S. and world soybean production: Graph of world soybean production (1922-1979) including graphs for the world total, USA, Asia total, and Latin America. Graph of U.S. soybean production, yields, and exports (1924-1979).

5. Analysis of the tofu industry in the West: The U.S. tofu market: overview and outlook. Graph of the number of tofu (and tempeh) manufacturers in the West from 1975 to 1982. Four-year analysis of the tofu industry in the West. Listing of North America's largest tofu manufacturers and their weekly tofu output. Japan's largest tofu manufacturers and their daily output. Favorite tofu, soymilk, and tempeh recipes as served at U.S. soyfoods, delis, cafes and restaurants, or marketed as ready-to-serve products. Books on tofu published in America.

6. Analysis of the tempeh industry in the West: Graph of number of tempeh manufacturers. Recipes. Listing of North America's largest tempeh manufacturers and their weekly output.

7. Analysis of the worldwide soymilk industry: Analysis of the soymilk industry in the United States. Analysis of the soymilk industry in Japan. Major Japanese soymilk companies and their products.

8. Analysis of the soy sauce / shoyu and miso industries worldwide. Statistics on fermented soyfoods in East Asia. The shoyu / soy sauce market in Japan (1886-1980). The miso market in Japan (1930-1980). Overview of the miso market in the United States. Miso exports from Japan (1981). Japan's ten largest miso manufacturers and their output.

9. Other: Analysis of the soynuts industry in the U.S. North America's larger soyfoods delis, cafes & restaurants. The soybean crushing industry; overview.

10. Soyfoods terminology and standards (Glossary of soyfoods terms): I. Traditional nonfermented soyfoods: Fresh green soybeans, okara, roasted soy flour (soy coffee, soy

chocolate), soybeans, soymilk (soymilk ice cream, soymilk soft serve, frozen soymilk yogurt, soymilk mayonnaise, soy shakes, soy nog, soymilk whipped cream), soynuts, soy sprouts, tofu (regular tofu, deep-fried tofu {deep-fried tofu cutlets called nama-age or atsu-age in Japan, deep-fried tofu burgers or burger balls, called ganmodoki or hiryozu in Japan, deep fried tofu pouches (called aburage in Japan; the words “deep-fried” may be dropped from the names after the initial usage, and in recipes or on package labels, if desired}), silken tofu {made without separation of curds and whey, called kinugoshi in Japan; modern types, all made with glucono delta-lactone as coagulant, and all known in Japanese as juten-dofu, are packaged lactone silken tofu, bagged lactone silken tofu (fukuro-dofu), sealed lactone silken tofu (buro-dofu), and Ever-Fresh Lactone Silken Tofu (in Tetra-Pak)}, grilled tofu, frozen and dried-frozen tofu. (Note: It is illegal to describe the latter product as “freeze-dried tofu,” since freeze-drying is a completely different process), terms associated with making tofu {fresh soy puree, a coagulant or curdling agent, forming box, filter bag or pressing sack, tofu comes in cakes, not blocks}), whole soy flour, flakes, and grits, yuba.

II. Traditional fermented soyfoods: Fermented soymilk products (soymilk yogurt {Soy Yogurt, Soyogurt, Soygurt}, acidophilus soymilk, soymilk kefir, viili, piima, buttermilk {Soy Kefir, etc.}), fermented tofu (wine-fermented tofu, brine-fermented tofu), miso (rice miso, barley miso, soybean miso, Chinese soybean chiang), natto (thua-nao from Thailand and kinema from Nepal; all are non-salted), soy nuggets [fermented black soybeans] (Chinese soy nuggets know as shih, tou-ch’ih, tou-shih, or dow-si; savory soy nuggets called Hamanatto in Japan, Daitokuji soy nuggets called Daitokuji natto in Japan, Philippine soy nuggets called tausi or tao-si in the Philippines, Indonesian soy nugget paste called tauco, formerly spelled tao-tjo, Malaysian soy nugget sauce called tao-si), soy sauce (shoyu. The five basic types of Japanese shoyu are: regular shoyu called koikuchi shoyu in Japanese, light-colored shoyu called usukuchi shoyu, tamari shoyu, clear shoyu called shiro shoyu, and rich shoyu called saishikomi shoyu), tempeh, other fermented soyfoods.

III. Soy oil and modern soy protein foods: soy oil, defatted soy flour, flakes and grits, soy protein concentrate, soy protein isolate, textured soy protein products (TSP, TVP is a registered trademark of the Archer Daniels Midland Company and cannot be used as a generic name for this product), meat analogs (foods typically made from spun soy protein fibers to resemble meat, fish, or poultry products).

11. Names of soyfoods around the world: Names of 40 products. Brazilian / Portuguese names. British English names. Chinese names (fermented tofu is Toufu-ju or Sufu). French names, German names. Japanese names. Spanish names.

12. Key institutions working with soyfoods in the West: The Soyfoods Center, Soyfoods Association of North

America, INTSOY, American Soybean Association, Bean Machines, Inc., Soycrafters Apprenticeship Program, USDA Northern Regional Research Center, Sojaquelle.

About The Soyfoods Center.

Note: This is the 2nd market study published by Shurtleff. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

906. Dominguez de Diez Gutiérrez, Blanca. 1982. Re: Names of soyfoods around the world: Spanish. Form filled out and returned to William Shurtleff at Soyfoods Center, July 9. 1 p. Handwritten. [Eng]

• **Summary:** Gives the names of all the various soyfoods in Spanish. Note: A typed list of these names is published in *Soyfoods Industry and Market: Directory and Databook*, 1985. 5th ed. p. 164.

“Fresh green soybeans—Frijol de soya tierno o ejote de soya. Whole dry soybeans—La soya, Frijol de soya. Black soybeans—Frijol de soya negro. Fresh soy puree—Pure de frijol de soya. Soy sprouts—Germinados de soya. Soynuts—Soya-nuez (nuez means walnuts or pecans), Soya-huate (means peanuts from cacahuate). Oil roasted soynuts—Soya nuez tostada (meaning nut). Dry roasted soynuts—Soya-huate tostado (meaning peanuts). Soynut butter—Mantequilla de soya. Roasted soy flour—Harina de soya tostada (kinako). Soy coffee—Soyafee. Soy chocolate—Soyalate. Soymilk—Leche de soya. Soymilk ice cream—Helado de leche de soya. Soymilk curds—Cuajada de soya, Jocoque de leche de soya. Tofu—Tofu, Queso de soya, Cuajada de soya. Soft tofu—Tofu blando. (Regular) Tofu—Tofu comun. Firm Tofu—Tofu firme. Extra firm tofu—Tofu extra firme. (Deep fried) Tofu cutlets—chuletas de tofu. (Deep fried) Tofu burgers—Hamburguesas o tortitas de tofu. (Deep fried) Tofu pouches—Saquitos de tofu. Silken tofu—Tofu sedoso. Pressed silken tofu—Tofu sedoso prensado. Grilled tofu—Tofu a la parrilla. Dried frozen tofu—Tofu seco congelado. Okara or soy pulp—Okara, pasta de soya, pulpa de soya. Yuba—Yuba. Fermented black soybeans—Palanquetas de soya. Miso or soybean jian—Miso (el). Soy sauce—Salsa de soya. Shoyu—Shoyu (el). Tamari—Tamari. HVP soy sauce—Have not found it. Tempeh—Tempeh (el). Fermented tofu—tofu fermentado. Fermented / cultured soymilk—Leche de soya fermentada. Natto, thua-nao, kinema—Natto (el). Soy oil—aceite de soya. Soy lecithin—Lecitina de soya. Soy flour—Harina de soya. Whole (full fat) soy flour—Harina de soya entera. Defatted soy flour—Harina de soya degasada. Soy grits and flakes—Soya martajada y hojuelas de soya. Cereal-soy blends (CSM, WSB, etc.)—Soyavena (with oatmeal). Soy protein concentrate—Concentrado de proteina de soya. Soy protein isolate—Aislado de soya. Textured soy protein products—Productos de soya texturizada. Textured soy flour, TSF, or TSP—Harina de soya texturizada. Textured soy concentrates—Concentrados de soya texturizada. Textured soy isolate—Aislados de soya texturizada. Spun soy protein fibers—Fibra de proteia hilada

de soya. Soy casmar, Soya Cocoa, Coco soya—Beverages made with chocolate or cocoa. Patisoya—Like spaghetti or noodles of different kinds made with soy flour—commercial products. Vegesoya—Commercial products for soups. Soya mex and Chocosoya—for beverages. Soya pac—Textured soya like meat, also a commercial product.” Address: Apdo. Postal 226, Jalapa, Veracruz, Mexico.

907. Shurtleff, William; Aoyagi, Akiko. 1982. History of natto and its relatives. Soyfoods Center, P.O. Box 234, Lafayette, CA 94549. 39 p. July 17. Unpublished typescript.  
 • **Summary:** A comprehensive history of the subject. Contents: Introduction. Etymology. Part I: History of natto in Japan. Sources of information. Theories of origin. Heian period (794-1185). Kamakura period (1185-1333). Muromachi period (1338-1600). Edo (Tokugawa) period (1600-1868). Meiji period (1868-1911). Taisho period (1912-1925). Showa period (1926-1981 and beyond). Popular types of Japanese natto. Natto in the prefectures. Pictures of natto containers. Part II: History of relatives of natto in East Asia. Unsalted / bland soy nuggets in China. Joenkuk-jang in Korea. Thua-nao in Thailand. Kinema in Nepal. Sere in Bali, Indonesia. Part III: History of natto in Europe. Part IV: History of natto in the United States.

Note: This is the earliest English-language document seen (Jan. 2012) that uses the word “Joenkuk-jang” to refer to Korean-style natto. Address: Lafayette, California. Phone: 415-283-2991.

908. *Toyo Shinpo (Soyfoods News)*. 1982. *Nattô no Hon hakkan*: Ryôri 80 hin o shôkai. Bunka Shuppan Kyoku, Nagayama-shi ra kyôcho [*The book of Natto* is published: Introducing 80 recipes. Co-authored by Bunka Shuppan Kyoku and Mr. Nagayama]. July 21. [Jap]  
 • **Summary:** A photo shows the front cover of the book, which retails for ¥1,200. At top of book’s title page (in English): “Natural Taste in Kitchen.” Below the Japanese title: “The Nattow.”

909. Barber, Linda. 1982. Natto: The taste of Japan. *Soyfoods*. Summer p. 70-71.  
 • **Summary:** “Some people say that the taste of Japan is a bowl of miso soup, but I would have to say it is natto, Japan’s original soyfood. Unlike miso or tofu, natto was discovered in Japan. The story goes that someone wrapped his meal of cooked soybeans in straw (the ‘baggie’ of 1000 years ago), and after a couple of days, unwrapped the bundle and found *Itohiki* natto. These fermented soybeans, held together by slippery filaments, were soon to become the traditional topping to a bowl of rice served at breakfast and dinner to millions of Japanese people.

“Today, natto is made by soaking washed soybeans overnight, then draining and pressure cooking them. After another draining, the beans are inoculated with *Bacillus*

*subtilis (Bacillus natto)* while still warm, scooped into perforated plastic bags and wrapped in straw (or they often are sometimes run into styrofoam containers that have holes for air circulation), then incubated at 40-45°C (104-113°F) for about 14-18 hours.

“Care is taken in not letting the natto get too hot. In natural fermentation the beans produce some heat on their own and keeping the temperature below 55°C (121°F) is important. After the 14 hours, the natto is put into cold storage, wrapped with a labeling band, boxed and shipped. One of the charms of natto is that it takes very little space or complicated equipment to manufacture.

“Not only is natto easy to produce, but it has high nutrition going for it too! This soyfood is 17% protein, 60% water, 10% fat, 10% carbohydrates, 2% fiber, 2% ash. As for other nutrients, natto has 0.07 mg vitamin B1, 0.50 mg B2, 1.1 mg niacin, 3.3 mg iron and 90 mg calcium. Also, research has shown that when we compare cooked soybeans with natto, the levels of thiamine, riboflavin and B12 are higher in natto thanks to the fermentation process.

“Yet, some experts say that the most beneficial characteristics of natto can’t be found on a nutrition chart. The wonder of natto lies in its bacterial medicinal qualities. Do the digestive enzymes present in natto prevent or cure digestive diseases? Or is natto only beneficial because it is a good natural food and an excellent source of protein that the body can easily assimilate because of the fermentation process? Without being caught in the medical discussion crossfire, it can be said for sure that natto is a nutritious food that can give any diet a new flavorful zing.

“Many people, even those with adventurous taste buds, find natto as a food quite a challenge. Actually, only about half of the Japanese care for it. Even so, most bars, sushi shops, and Japanese-style restaurants offer natto as daily fare.

“In Japan, natto is served in many ways. And now, with the rising cost of food, natto has taken on new dimensions. Once served only as a topping for rice or in miso soup, creative Japanese cooks now serve natto sushi, natto spaghetti, natto udon (wide, white wheat noodles), natto omelet, natto gyoza, natto sandwiches, natto tempura, chopped natto with cuttlefish, deep fried natto, natto salad, natto with mochi, and even a liqueur made with natto.

“After getting over my initial ‘gag’ reaction to eating natto, I was pleasantly surprised to find it tasted very much like a strong, rare cheese, I soon began making natto pizza, natto lasagna, and toasted natto sandwiches. At only 25 calories for 100 grams (3½ oz) my mind was turning spins developing recipes for this marvelous slippery stuff.

“Natto lends itself to western-style dishes quite nicely. How about natto fettucini, natto crepes, natto French onion soup, natto tortillas, natto frittata, nattoburgers, baked potatoes with natto topping, fried eggplant with natto, natto egg salad, or natto moussaka? My latest natto creation is

Natto Dip: Mix together 2 cups tofu mayonnaise, ½ cup chopped green onions, 1/8 teaspoon pepper, ½ cup chopped parsley, 10 oz. cooked and chopped spinach, ¼ cup natto, and salt (or shoyu) to taste. Serve with crackers or raw vegetables. Superb!

“Once you purchase a carton of natto you can keep a supply going like you do yogurt, but expect to buy a fresh starter every 3 or 4 batches. For home-style natto, boil soaked soybeans, drain and add a cube of purchased natto. Mix, and put into containers. I suggest styrofoam cups, fast food containers, or paper cups. Make sure they are clean and free from any other bacteria. Cover the inoculated beans with clear wrap (make holes with a hot needle for air ventilation). Set the cups, or containers, in a foam ice chest or wrap in a heating pad, or simply use a yogurt maker. Incubate for about 18 hours.

“If at the end of 18 hours your product is grayish in color, and forms a long string (filament) when you touch your finger to the surface, you know you’ve succeeded. Chill the natto, then enjoy it in one of the ways suggested above. You can always have natto on hand as it freezes well too!

“Before you say ‘Naa’ to natto, let me give you some hints that will make natto easy for you to swallow:

“1. The most important is to make sure that the natto you buy is *fresh*. It should be grayish in color with a little odor. When you touch natto, a lone string will form—the longer the better. Natto has a shelf life of about 1 week (I prefer to eat mine the day I buy it). If the natto is bad, it will taste bitter, smell very strong, and may even have mouldy spots or crystals on the surface. Junk it!

2. “Eat it as the Japanese do, in small amounts. The most traditional way is to mix the natto with a raw egg yolk, chopped green onion, mustard and a dash of shoyu. Scoop a little of this onto your next bowl of rice. I’ve also had this condiment served in a small dish alongside a cold beer. I’m sure it would make a hit even in Milwaukee!

“3. To get over the natural gooeyness of natto, serve it in foods where you would expect, and want, some ‘slip.’ Natto acts like melted cheese. How about glueing a taco together with a topping of natto?

“Another type of natto I like is dried natto (*hoshi natto*). Sold as a snack food, this soyfood is very salty in taste, resembles raisins coated with flour, and is unslippery to the touch. Yet, it has a gooey mouthfeel. Enjoy this type with a cup of green tea, or sprinkle a few grains on a bowl of rice. As a break from tradition, chop up a few and use them as a salty seasoning to whatever you cook: soups, stews, casserole baked goods, or even apple pie.

“In reading or talking about natto, one often runs across the kind referred to as *Hamanatto*. Unlike *Itohiki* natto, this ‘natto’ is made by a different process and uses the bacteria [sic, mold] *Aspergillus oryzae*. *Hamanatto* originated in China. Nutritionally it is 34% water, 28% protein, 14% fat, 13% carbohydrate, 2% fiber, 10% ash. Calcium is listed as

140 mg, iron 8.3 mg, and sodium as 2,900 mg.

“As you can see from the sodium count, *Hamanatto* is quite salty and the taste is reminiscent of Hatcho miso. Blackish and chunky, this ‘natto’ is sometimes referred to as ‘Soy Nuggets’ [fermented black soybeans], or ‘Raisin-like Natto’ by some Westerners.

“No matter how you eat it, natto is an intriguing soyfood. This natural, whole food is indeed a taste of Japan, and after 1000 years it’s still going strong in a world of fast foods.

“The author, a trained home economist who lived in Japan for many years, has recently returned to her home in Wisconsin.”

Photos (taken by Linda Barber in July 1981) show: (1)



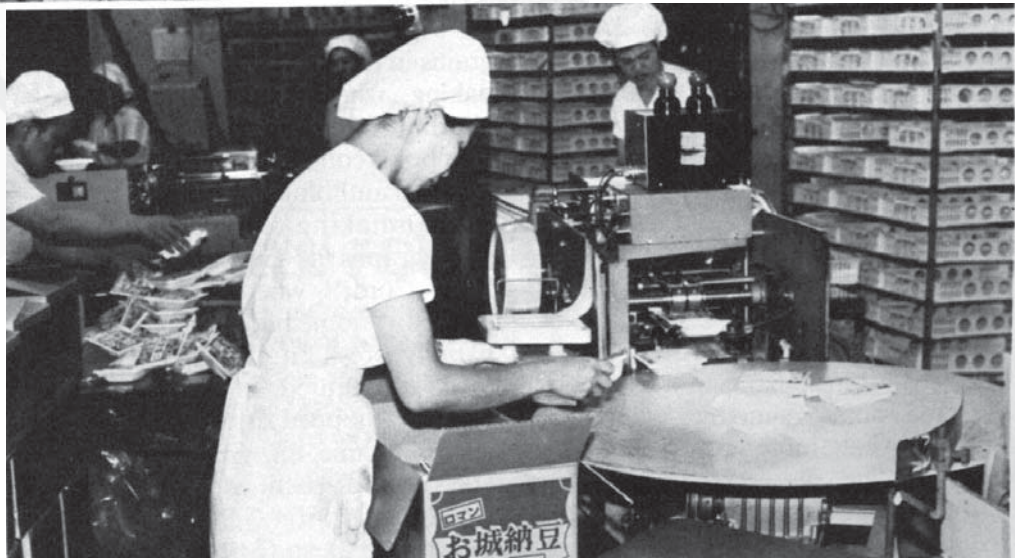
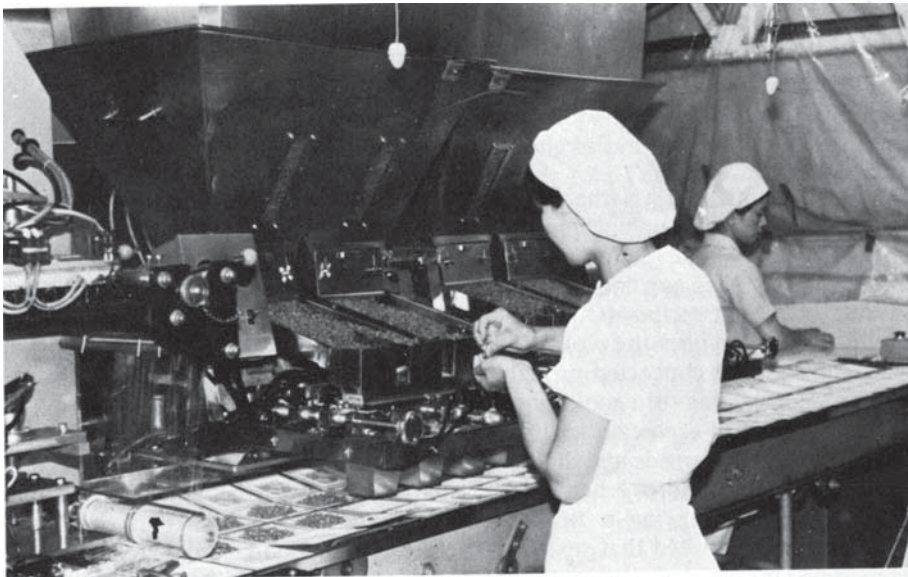
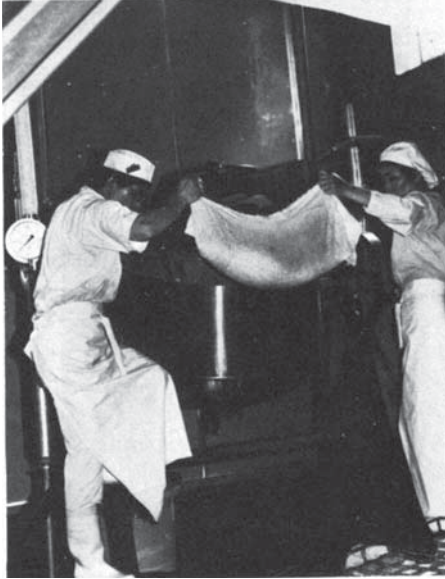
Natto sold retail, packaged in rice straw. (2) Some natto being lifted, using chopsticks, up from a package of natto. Four photos showing “How natto is made” commercially in Japan. (3) The soybeans are steam cooked. (4) Then inoculated with natto bacteria. (5) Run into containers and incubated 14-18 hours. (6) Then packaged, boxed, and shipped.

Note: This is the earliest document seen (Jan. 2012) that mentions *hoshi natto* (“dried natto”). Address: Japan and Wisconsin.

910. Richman, Phyllis C. 1982. Do it yourself sushi: Japanese call the style temaki and most can master it. *Washington Post*. Aug. 15. p. D1.

• **Summary:** The section titled “Condiments” notes that they always include ginger, “soy sauce; *wasabi* (Japanese horseradish);...”

“Interesting possibilities: *umeboshi* (salted plums, pitted and mashed);... slices of dark, fleshy *shiitake* mushrooms marinated in sugared soy sauce;... *natto* (fermented soybeans);...”





911. Parker, Joyce. 1982. Re: Soyfoods and soybeans in Nepal. Letter to William Shurtleff at Soyfoods Center, Aug. 28. 3 p. Handwritten with signature on letterhead of the Britain Nepal Medical Trust (Koshi Anchal).

• **Summary:** She is a Peace Corps volunteer living in the eastern middle hills of Nepal, eating the local food, and going crazy. Nepal is extremely diverse culturally, so what is done in one part of the country may not be true of other parts. Tofu is made in Kathmandu, the capital of Nepal, but only on a very small scale. In the eastern middle hills, soybeans are used mostly for a snack (*khaajaa*) in the early afternoon, often with tea—to sustain people until the evening meal. “The snack I’m familiar with is called *Bhatmas ani chiuraa*... and is made with soybeans and beaten rice. The mature soybeans are roasted over an open hearth, usually in a heavy cast iron wok—stirred with a stick continuously (the pan is dry but well seasoned) for 5-10 minutes. Remove from heat—put into a *jato* (primitive grinding stone) only to split the soybeans in half. A small amount of *mattitel* (mustard oil) is heated until the smoke rises (otherwise the taste is foul)—*pyaaj* (green onion—chopped fine) and *jursaani* (chili pepper also chopped fine) and fresh ginger are added, and next the *bhaatmas*—stir until they are covered with the oil mixture—salt is also added. It is then served hot or cold over the beaten rice. Its delicious—a real favorite with me—puts a bit of crunch into your diet.

“Soybeans are usually grown in a companion planting system with the *makai* (corn) or along the borders of the rice *khets* (irrigated fields). I have never seen the soybean grown in a *bari* (dry field) as a main crop. Main crops include rice, wheat and corn. Soybeans are always an afterthought. There is a British Aid Agricultural Farm at Pakhribas (in the Kosi Zone of eastern Nepal, 3 hours from Dhankuta) working on soybean trials.” They came up with 3 varieties of soybeans which will grow in different terrains. More technical information can be gathered from them.

The Limbu live in the high hills and are “jungly types.” “One of my co-workers is of Limbu origin and was the only one that knew about kinema or kenima (couldn’t get the correct spelling but will keep trying). It seems it is a good trekking food. They make a soup of it and pour it over rice—keeps well—easy to cook. Lentils, a much preferred food, take too long to make on the trail. After my trip to Ilam—investigating the Limbu land—I’ll write more specific details. From what I could gather:” Boil soybeans until they are soft. Grind to a mush with a local mortar and pestle. Add ashes (*kharain*) from the cooking stove (*chulo*) and mix with the soybeans. Place in a bamboo basket (*dhahi*), cover, and leave for 24 hours. Remove from basket, place on a bamboo mat, and dry in the sun. Recipes vary. “I have never tasted any but it sounds awful. More research is required. I’ll keep you informed.”

Newsflash—the SCF clinic is looking into using soymilk

as a substitute food for babies—only when the mother is unable to breast-feed. We have also discussed possible weaning foods. One problem—soymilk is not high in calories; both calories and protein are rare commodities. “The value of the soybean’s body building protein would be lost and just burned off as energy.” The biggest problem here is just a lack of food, The Nepali diet is healthy but too many mouths to feed. Address: c/o U.S. Peace Corps, P.O. Box 613, Kathmandu, Nepal.

912. McGregor, Otis. 1982. Soybeans—The human consumption approach. *Notes on Agriculture (Guelph, Ontario)* 18(1):13-14. Aug.

• **Summary:** “In 1974 the Ontario Soya-bean Growers’ Marketing Board launched a program directed to the human consumption market... In 1974 the Ontario soybean export market represented a single shipment of white hilum soybeans to Japan for processing into tofu, miso and natto. Today tofu and miso are becoming popular in Ontario.

“Since 1975 the Ontario Soy-Bean Board has experienced remarkable success in moving soybeans into the human consumption market and the diets of Canadians. Two cookbooks have been printed by the Board and distribution has exceeded 70,000. Tofu shops have emerged in Ontario, to the extent that franchising is in the offing. Toronto has restaurants serving soybean meals... Today, the Ontario Soya-Bean Growers’ Marketing Board actively promotes whole soybeans in one pound bags in various supermarkets.” Address: Ontario Soya-bean Growers’ Marketing Board, Chatham, ONT, Canada.

913. Hara, Toshio; Ueda, Seinosuke. 1982. Regulation of polyglutamate production in *Bacillus subtilis* (*natto*): Transformation of high PGA productivity. *Agricultural and Biological Chemistry* 46(9):2275-81. Sept. [30 ref. Eng]

• **Summary:** The viscous or “sticky” material in natto, produced by *Bacillus subtilis*, consists of polysaccharide (levan-form fructan) and polyglutamate (PA). Address: Dep. of Food Science & Technology, Faculty of Agriculture, Kyushu Univ., Hakozaki, Fukuoka 812, Japan.

914. Asunaro Eastern Studies Institute. 1982. Natural foods preparation with Sensei Noboru Muramoto (Poster). P.O. Box 2546, Escondido, CA 92025. 1 p.

• **Summary:** Noboru Muramoto, author of *Healing Ourselves*, will be presenting a series of 2 week classes on natural foods preparation at the Asunaro Institute in rural southern California. Students will participate in the preparation of miso, tamari, koji, amasake, mochi, tofu, and tekka. Address: Escondido, California.

915. Kanasugi, Goro. 1982. Yokubatta negai [A greedy wish]. *Daizu Geppo (Soybean Monthly News)*. Oct. p. 8-9. [Jap]

• **Summary:** The author, vice-president of the Japanese Natto Association, would like to see tempeh become popular throughout Japan. Address: Zenkoku Natto Kyodo Kumiai Rengokai, Fuku Kaicho.

916. Aihara, Herman. 1982. History of work with macrobiotics and Chico-San. Part II (Interview). Conducted by William Shurtleff of Soyfoods Center, Nov. 29. 5 p. transcript.

• **Summary:** Continued: Chico-San imported their first Japanese foods from Herman personally. At that time, there was no Muso and no Nippon CI. Ohsawa Japan (which started in about 1965) was the trading / export company and Nippon CI was devoted to education. Before Muso was “Three Boys,” the “Three L” (*San-L*) company. Ohsawa told them to take charge of exports. Then Mr. Okada took over from them. Osaka was PR and education. “Three L” (which started in about 1962 in Osaka) was whom Chico-San was importing from. George Ohsawa kept a careful watch over what was being exported from Japan. Chico-San later imported from both Muso (Osaka) and Ohsawa Japan (Tokyo). Note: Did Ohsawa have two trading companies? If so, why?

The first edition of *The Book of Judgment* was printed in Japan in about 1956, then revised in 1966. There is no publication date in the book. This book came after *Zen Macrobiotics*. It is actually *The Philosophy of Oriental Medicine* (subtitled *The Book of Judgment*), probably first written in French.

Herman has just started writing a biography of Ohsawa, but he is too busy, so it will not be finished for a long time.

The Ohsawa Foundation in Paris was started by 1956 by George Ohsawa. The Ohsawa Foundation in Tokyo started before 1960. The Ohsawa Foundation in Los Angeles was started in 1965 by Lou Oles, an older Jewish trumpet player. The Ohsawa Foundation of New York was founded in 1961 by Michio Kushi and Irma Paule. The name “GOMF” was coined in 1970.

Herman has a green 8½ by 11 inch edition of *Zen Macrobiotics*. Herman says the date was about 1960. It shows that the Ohsawa Foundation then existed in New York, Paris, Brussels, and Tokyo. It also contains lots of recipes. I copied some pages. Copyright date of the fifth edition was 1966, Ignoramus Press, the Ohsawa Foundation, 1424 N. Curson Ave., Los Angeles.

Michio Kushi was Ohsawa’s senior student in the sense that he came to America first. I should omit the concept that Herman was Ohsawa’s closest associate. Herman and Michio simply have different styles. Michio has broad appeal; he has started a mass movement, and is more businesslike. Herman appeals to a small group, deeply; he works more with individual students.

Lou and Shayne Oles got involved with macrobiotics during the second summer camp, in 1961. They traveled

with the group from New York to Chico. He was a famous trumpet player, worked with Benny Goodman. In California he emphasized publishing more than his trumpet. His first publication was titled *Spiral*; 1-2 issues were published. Then *Macrobiotic Monthly*. After Beth Ann Simon’s death, Chico-San was separated from educational work. Lou Oles went to Los Angeles and that year established the Ohsawa Foundation; he did education and publication. He published three books: *Zen Macrobiotics*, *Book of Judgment*, and *Guidebook for Living*. Jacques DeLangre helped him. Lou died in 1967 of cancer. He got depressed when George Ohsawa died; he started drinking coffee, which may have activated his cancer growth. Shayne continued his work. Lima asked Herman to be president, so he traveled to Los Angeles once a month. In those days they sold lots of *Zen Cookery* books. The Ohsawa Foundation in Los Angeles closed in about 1970.

Yes, Ohsawa was age 72 when he died. He died April 24 (Japan date) in Japan.

The spirallie multidimensional scale from yin to yang was Peter Milford’s idea, not Herman’s. It is generally a linear scale.

Infinity Foods, founded by Howard Rower, is still in existence. Herman thinks they started in about 1962, and they imported foods from Japan.

Chico-San established only one organic grower—the Lundbergs for rice. The controversy was complicated. The Lundbergs and Bob Kennedy of Chico-San made a contract. Eventually there was a lawsuit between Chico-San and Lundberg [but it was resolved before it went to court]. Herman thinks Lundberg sued Bob Kennedy.

In 1963 Herman went on the lecture circuit with Bob Kennedy as they tried to educate people about the macrobiotic foods that Chico-San was selling.

The first summer camp without Ohsawa was 1967 (or perhaps 1968).

*Macromuse* is published in Washington, DC, by Michael Rosoff. It started in 1981.

Chico-San was founded in Jan. 1962. In Nov. 1962 Chico-San’s first location (a retail store) opened, downstairs with hearing aid company. It moved upstairs to a different location and opened on 6 March 1962; they had an open house.

In 1973 the Aiharas established the Vega Institute, a residential program for macrobiotic studies in San Francisco. Then in 1974, they moved the Vega Institute and the George Ohsawa Macrobiotic Foundation to Oroville, a town southeast of Chico, where the Aiharas continued their work, together with their students. Herman and Cornelia Aihara moved to Oroville instead of Chico because it was more rural and because Peter Milbury, a high school teacher in Oroville, knew of some good land. The Ohsawa Foundation in San Francisco bought the land, and then they moved. Herman owns the Vega Institute on Oak Street.

Junsei Yamazaki came to the USA in 1963. Ohsawa told him to help Americans grow brown rice. First he tried in New York, but there was not enough sun. He originally graduated with a degree in fermentation from a major Japanese university, but he then became a rice farmer. Then in New York City he went to work with Michio at Musubi near Takashimaya—for little pay. The Chico group invited him to Chico. He worked on the rice cake machine—again poor pay. Like Herman he also worked with orchids.

In 1971 Herman invited Noboru Muramoto to be on his lecture trip. His first guest was Alcan Yamaguchi in 1970. Herman read Muramoto's articles in a Japanese magazine. He had family problems in Japan and was happy to stay here. Herman was his guarantor, and he became a permanent resident.

Chico-San began baking in March 1962 in an upstairs store; Herman was the first baker.

Herman talked with Michio Kushi this summer. They have a friendly relationship but both are very busy.

Junsei Yamazaki's plans with Chico-San are not clear; he may end up working on his own.

A good Japanese-language biography of George Ohsawa is *Kakumei-ji*, by Matsumoto Ichiro. He interviewed Lima Ohsawa.

Herman likes the term “a macrobiotic” better than “a macro” or “a macrobiotic student / follower.”

Cornellia arrived in the U.S. in 1955.

The Ohsawa Foundation did not move from Chico to Los Angeles; it never existed in Chico—only in Los Angeles.

Overview of macrobiotic contribution. Typical Americans overemphasize the importance of protein (even though nutritionists may not agree). Most people who stop eating meat start consuming more dairy products. Macrobiotics avoid dairy products and go straight to grains plus legumes—with little mention of protein.

Mari Metz has a good color photo of Herman and Cornelia together.

Erewhon was hurt by high interest rates and inflation.

In 1960 the handbound book *Zen Macrobiotics* was made in Herman's apartment in New York City. In it Ohsawa used the word “syoyu” [shoyu]. He changed to tamari because when he introduced soy sauce to Europe he initially called it “shoyu.” He then gave exclusive distribution rights to a European to distribute Ohsawa's selected shoyu. The man called it “Ohsawa Shoyu,” but then in about 1960-61 he started importing low-quality shoyu from Japan and selling it under the same brand name. Ohsawa could do nothing to stop him. That was when Ohsawa started using the word “tamari” to refer to natural shoyu. Herman heard this story directly from George Ohsawa—whose name in Japanese is pronounced OH-sawa.

Herman says a healthy person may eat 12-16 ounces of tofu a week, but it is not recommended for cancer patients who need a diet that is more yang.

Herman came from Kyushu, moved to Tokyo at age 9. He likes natto. Address: Oroville, California.

917. Kushi, Michio. 1982. *Cancer and heart disease: The macrobiotic approach to degenerative disorders*. Tokyo: Japan Publications, Inc. 224 p. Nov. Illust. Index. 26 cm. [50\* ref]

• **Summary:** Contents: Foreword, by Michio Kushi. Foreword by Edward Esko. 1. The macrobiotic approach, by Michio Kushi. 2. Cancer and diet. 3. Diet and heart disease. 4. Macrobiotics, preventive medicine, and society. 5. Case histories. Appendixes: Food policy recommendations for the United States, by Michio Kushi. East West Foundation—Diet and health related activities, 1972-1982. Bibliography.

Many of the subchapters in this book are written by physicians. For example, William P. Castelli, M.D., contributed a 5-page original article titled “Lessons of the Framingham Heart Study.” There are also articles by Robert S. Mendelsohn, M.D., Keith Block, M.D., and Christiane Northrup, M.D. Miso, tempeh, natto, tofu, and soy sauce are all discussed as foods that can be used to help in the prevention and cure of these two major diseases. Address: Brookline, Massachusetts.

918. *Manna Bulletin (Amsterdam, Netherlands)*. 1982. Fermentatieprodukten essentiële aanvulling op plantaardige dieet [Fermented products, an essential supplement to a vegetarian diet]. 4(3):9-11. Autumn. [Dut]

• **Summary:** Mentions tamari soy sauce (*Tamari-sojasaus*, fermented for 2 years), miso (*Miso-sojapasta*, fermented for 2 years), tempeh, and natto.

919. Hara, Toshio; Aumayr, Andrea; Fujio, Y.; Ueda, S. 1982. Elimination of plasmid-linked polyglutamate production by *Bacillus subtilis* (natto) with acridine orange. *Applied and Environmental Microbiology* 44(6):1465-58. Dec. [21 ref]

• **Summary:** Natto is a traditional Japanese fermented food produced from soybeans by *Bacillus subtilis* (natto). It consists of a polysaccharide (levan-form fructan) and a polyglutamate (PGA). The composition of its viscous material is mainly gamma-PGA, containing D- and L-glutamate in varying proportions.

Three known strains of *Bacillus subtilis* (natto) are Asahikawa, F, and M. Address: Dep. of Food Science and Technology, Faculty of Agriculture, Kyushu University, Hakozaki, Fukuoka 812, Japan.

920. Kim, Kil Hwan. 1982. Kohng, dubu wa kohng nah mul eh kwah hak [The science of soybeans, tofu and soy sprouts]. Seoul, South Korea: Korean Science Foundation. 211 p. Dec. Illust. Index. 21 cm. [200+ ref. Kor]

• **Summary:** Contents: I. Soybeans. Introduction. World soybean production: Areas of production, quantities produced, amount produced in Korea, amount imported

to Korea, chemical composition of all soybeans. How to use soybeans: Foods and processed soybean foods (sauces, tempeh, natto), industrial uses. Nutritional composition of soybeans: Common components, protein and amino acids (protein, essential amino acids, necessary protein intake, necessary amino intake, chemical score, biological value of soybean protein, the need to heat soy protein, the use of soy protein as a protein supplement), soybean oil (components of soybean oil, oil assimilation / absorption), other nutritional components (carbohydrates, vitamins, minerals), references.

II. Tofu. Introduction. Kinds of tofu and production: Soybean curd (production in factories, production at home, instant tofu, kinugoshi tofu, grilled tofu, frozen tofu, how to freeze and dry tofu). Movement of nutritional values during tofu processing: Movement of common nutrients, movement of amino acids. Nutritional components of tofu: Tofu protein, tofu protein as a protein supplement, digestion of tofu, calories in tofu, fat and cholesterol, minerals and vitamins, toxins, *hwe bun* in tofu. Tofu and group meals: School meals in Japan, in America, in Korea. Tofu factories and associations involved with tofu: Member list of food associations in Korea, regular member and extra member list of tofu packaging associations in Japan, directory of tofu shops and factories in North America, in Europe, in other countries, list of companies selling tofu coagulants, list of tofu restaurants in Japan. References.

III. Soy sprouts. Introduction. Production of soy sprouts: Soybean varieties, selecting and washing the soybeans, soaking, watering the sprouts, machines for cultivating soy sprouts, maintenance. Nutritional composition of soy sprouts: Common nutrients, increase of vitamin C during growth, changes in vitamin C during heating, changes in riboflavin during heating. Glossary.

Soybeans arrived in Korea in about 200 B.C. (p. 11). Contains many useful tables. Address: Korea.

921. **Product Name:** [Natto, Agé, Okara].

**Foreign Name:** Natto, Ague, Okara.

**Manufacturer's Name:** Agro-Nippo Produtos Alimenticios Ltda.

**Manufacturer's Address:** Av. José Alves de Mira 185, Piribuba, Sao Paulo, Brazil.

**Date of Introduction:** 1982.

**New Product-Documentation:** Letter from Jane Cadwell Pautz in Sao Paulo, Brazil. 1982. May 29. The company sells natto, sprouts (mung bean type), agé (*ague*); sometimes they sell the okara in the open market.

Note: We have no idea when each of these products was introduced. This is the earliest known commercial natto maker in Brazil.

922. Kim, K.J.; Ryu, M.K.; Kim, S.S. 1982. [Chungkook-jang koji fermentation with rice straw]. *Hanguk Sikip'um Kwahakhoe Chi (Korean J. of Food Science and Technology)*

14(4):301-08. [33 ref. Kor; eng]

Address: 1&3. Dep. of Food Science & Nutrition, Sook Myung Woman's Univ., Seoul 140; 2. Lab. of Sampyo Food Indust. Co., Ltd., Seoul 131, South Korea.

923. Ryo, S. 1982. [Food and vitamin K in breast milk]. *Shusanki Igaku (Perinatal Medicine)* 12:1101-06. (Chem. Abst. 97:214711). [Jap]\*

924. Suh, Jeong-Sook; Lee, S.G.; Ryu, M.K. 1982. [Effect of bacillus strains on Chungkook-jang processing. II. Changes of the components and enzyme activities during the storage of Chungkook-jang]. *Hanguk Sikip'um Kwahakhoe Chi (Korean J. of Food Science and Technology)* 14(4):309-14. [23 ref. Kor; eng]

Address: 1-2. Seoul Junior Health College, Seoul 100; 3. Lab. of Sampyo Food Indust. Co., Ltd., Seoul 132.

925. Aihara, Cornellia. 1982. *The dô of cooking: Complete macrobiotic cooking for the seasons*. Oroville, California: GOMF Press (George Ohsawa Macrobiotic Foundation). 230 p. Illust. by Carl Campbell. Index. 28 cm.

• **Summary:** This is a compendium of four seasonal cookbooks, each with the title *The Dô of Cooking (Ryorido)*, first published individually in 1971. Contents: Preface. Introduction. Selecting good foods. The secret of cooking. Spring. Summer. Autumn. Winter. Glossary. Cutting styles. Topical index (within each major food category {grains, grains with vegetables, seaweeds, beans and tofu, etc.}, recipes are listed alphabetically). Recipe index (of all recipes).

Contains many recipes calling for: Miso, natto, tofu (regular, deep-fried, and frozen). Also: Amazake, azuki beans, kuzu, mochi, sea vegetables, seitan (wheat gluten), sesame seeds and gomashio.

Near the front of the book is a biographical sketch and photo of Cornellia Aihara. She was born in 1926 in Fukushima, Northern Japan. She learned macrobiotics from George Ohsawa when he came to her town (Aizuwakamatsu) for lectures; this changed her life. While in school, she began corresponding with Herman Aihara, who was living in New York. In 1955 he invited her to New York. Although they had never met, she trusted him and went to American with only ten dollars in her pocket. They were married soon after her arrival in New York. There they engaged in retail business. When Mr. and Mrs. Ohsawa came to the USA from Europe, Cornellia studied macrobiotic cooking by helping Mrs. Lima Ohsawa at the first macrobiotic summer camps on Long Island in 1960; in the Catskill Mountains in 1961; at the University of California at Chico in 1963; and at the Big Sur Camp in 1964. Since 1961 Cornellia has devoted her life to the teaching of macrobiotic cooking, childcare, home remedies, and philosophy. Since 1965 Cornellia and Herman Aihara have organized fourteen macrobiotic summer camps

in California; her cooking has been the biggest attraction.

On the cover is a large color photo of freshly prepared food, including deep-fried tofu slices. Address: 902 14th St., Oroville, California 95965.

926. Anthonio, H.O.; Isoun, M. 1982. Nigerian cookbook. Hong Kong and London: Macmillan. iv + 216 p. Illust. Index. 23 cm.

• **Summary:** This primarily Yoruba (western Nigerian) cookbook briefly mentions soybean oil on pages 16 and 24. The latter page states: "Soybean oil has many nutritional advantages, but, unfortunately, it is not commonly available yet in Nigeria. It is sometimes a constituent of the 'vegetable' oils seen in the markets."

Pages 27-28 contain a section on the fermented locust bean (*Parkia filicoide*, *Parkia biglobosa*) which is called *oru* in Yoruba, *eginili-igala* in Ibo, *ete-edi-uku* in Efik, and *kalwa* in Hausa. "The seeds are used extensively throughout Nigeria as a flavourful and nutritious addition to soups and stews." Soybeans are not mentioned.

The book contains many recipes for meat, fish, and poultry. Address: 1. Head, Ibadan University's Catering Dep., Ibadan, Nigeria.

927. Aykroyd, Wallace R.; Doughty, Joyce. 1982. Legumes in human nutrition. 2nd ed. Rome, Italy: Food and Agriculture Organization of the United Nations (FAO). viii + 152 p. Illust. 28 cm. The original edition was 1964. [Eng]\*

• **Summary:** Contents: Preface. Introduction. History of legumes. Production and consumption. Composition and nutritive value. Methods of processing and cooking. Effects of processing on nutritive value. Toxic substances. Legume proteins. Observations on the value of legumes in human feeding. The place of legumes in human diets. Appendixes. References.

On pages 49-51 are sub-sections on: Traditional fermented soybean products (methods of preparation are detailed in Appendix 5): Soy sauce (shoyu), soy paste (miso), tempeh, natto, Hammanatto. Protein separation and other extraction techniques. Soy-milk. Soybean curd (tofu). Modern products from soybeans. Soy flour and grits. Soy protein concentrates. Isolated soy protein.

Under tofu (p. 50): "The curd may also be fermented to make soy-cheeses, which resemble the more highly flavoured European cheeses. These are known in China as *chou tofu*, which means stinking bean curd." See also p. 120, where yuba is mentioned.

Note: This 1982 edition was made by revising the original 1964 edition. The revisions were made by Joyce Doughty and Ann Walker (Dep. of Food Science, University of Reading). Dr. Wallace Aykroyd died in Feb. 1979 just as he was taking the first steps toward this revision. Address: 1. Dep. of Human Nutrition, London School of Hygiene and Tropical Medicine; Former Director, Nutrition Div., FAO,

Rome, Italy.

928. Ebine, Hideo. 1982. Fermented soybean foods in Japan. In: S. Saono, F.G. Winarno, and D. Karjadi, eds. 1982. Traditional Food Fermentation as Industrial Resources in ASCA Countries. xvii + 259 p. See p. 41-52. Proceedings of a technical seminar, held 9-11 Feb. 1981 at Medan, Indonesia.

• **Summary:** Production statistics for miso and natto from 1970-1979 were presented. Miso increased from 552,207 tonnes in 1970 to a peak of 590,137 tons in 1973, followed by a gradual decrease to 567,776 tons in 1979. Natto production increased from 100,000 tonnes in 1970 to 158,000 tonnes in 1979. Statistics on the production of fermented black soybeans (Tera Natto or Hama Natto) are not available, but are roughly estimated at 10,000 tons.

An outline is then given of the chemical composition of the different types of miso and natto as well as their methods of manufacturing. Of the many beneficial characteristics of miso, the following are worthy of note: it has strong antioxidative activity, a strong buffering activity, and a bactericidal like effect against pathogens.

"Natto is one of the typical and popular soybean foods in the Japanese diet. It is classified into 2 major types; one is called Hama Natto which resembles soybean miso in colour and flavour; the other is called itohiki natto. When referred to simply as natto, it generally means itohiki natto. Natto is a unique soybean food, fermented by *Bacillus natto*. The surface of fermented natto is covered with characteristic viscous and slimy substances consisting of *B. natto* cells and polymers of glutamic acid." Address: Applied Microbiology Div., National Food Research Inst., Ministry of Agriculture, Forestry and Fisheries, Yatabe, Ibaraki-ken, Japan.

929. Kanoe, M.; Kido, M.; Komatsu, T.; Toda, M. 1982. Growth inhibitory effect of *Bacillus natto* on several microorganisms of animal pathogenicity. *Bulletin of the Faculty of Agriculture, Yamaguchi University (Yamaguchi)* 33:1-24. [Jap; eng]\*

Address: Yamaguchi Univ.

930. Ko Swan Djien. 1982. Indigenous fermented foods. *Economic Microbiology* 7:15-38. A.H. Rose, ed. Fermented Foods. [67 ref]

• **Summary:** Contents: 1. Introduction. 2. Foods fermented by moulds: Roles of the moulds. 3. Foods fermented by bacteria: Fermented vegetable products, fermented fish products, fermented seeds (natto, thua-nao, dagé), fermented starch-rich raw materials (fermented maize products, fermented rice products, fermented cassava), fermented plant juice.

4. Foods fermented by a mixture of moulds and yeasts: Ragi, micro-organisms, fermented starch-rich raw materials.

5. Foods firstly fermented by moulds [as in making

koji], followed by a fermentation with a mixture of bacteria and yeasts (the salt-tolerant yeasts are species of *Saccharomyces* and *Torulopsis*; the bacteria are species of *Pediococcus* and *Streptococcus*): Tane koji, soy sauce, other fermented soybean products (tauco {porridge of dry consistency}, miso, hamanatto {which is soft and has a high moisture content}, tou-shih {which has a much lower water content than hamanatto and is therefore not so soft}. These “fermented soybean products are also used as flavouring agents in cooking as well as table condiments or as a side dish”).

6. Specific aspects of fermented foods: Mould species, lactic-acid bacteria, yeasts, salt. 7. Acknowledgement.

References.

Concerning soy sauce (p. 30-31): “Japanese *shoyu* is made from equal amounts of soybeans and wheat.” The “raw materials are inoculated with tane koji which contains spores of selected strains of *Aspergillus oryzae* and *A. soyae*. In less sophisticated soysauce factories throughout South East Asia, mould species grow spontaneously on the soybeans by natural contamination from the air and from the bamboo trays on which soybeans of former batches were incubated (Bhumiratana et al., 1980). The moulds involved are species of *Aspergillus*, *Rhizopus*, or *Mucor*. Some Indonesian *kecap* manufacturers inoculated the cooked soybeans with tempe [tempeh] inoculum which contains spores of *Rhizopus oligosporus*.”

Tables: (1) Conferences discussing aspects of indigenous fermented foods (1977-1981, chronological). (a) Symposium / Workshop on Indigenous Fermented Foods, Nov. 21-26, 1977, Bangkok, Thailand. (b) World Conference on Vegetable Food Proteins, Oct. 29–Nov. 3, 1978, Amsterdam, The Netherlands, (c) Symposium on Fermented Foods, Nov. 22, 1978, London, England. (d) International Symposium on Oriental Fermented Foods, Dec. 10-14, 1979, Taipei, Taiwan. (e) United Nations University Workshop on Research and Development Needs in the Field of Fermented Foods, Dec. 14-15, 1979, Bogor, Indonesia. (f) VIth International Fermentation Symposium, July 20-25, 1980, London, Ontario, Canada. (g) Eighth Conference of Association for Science Cooperation in Asia (ASCA), Feb. 9-15, 1981, Medan, Indonesia.

(2) Origins of various fish sauces. (3) Origins of various fish pastes. (4) Names given in various countries to an inoculum used to manufacture food products. (5) Names given in various countries to fermented glutinous rice (*Oryza sativa glutinosa*). (6) Names given in various countries to rice wine. (7) Names given to soy sauce in different countries (*Chiang-yu* in China, *Kan jang* in Korea, *Kecap* in Indonesia, *Shoyu* in Japan). (8) Soybean foods produced by a two-stage fermentation (*Hamanatto* and *miso* in Japan, Soy sauce in the Orient, *Taoco* in Indonesia, *Tao-si* in the Philippines, and *Tou-shih* in China). Address: Dep. of Food Science, Agricultural Univ., Wageningen, Netherlands.

931. Kushi, Micho; Kushi, Aveline. 1982. Macrobiotic dietary recommendations. East West Foundation, P.O. Box 850, Brookline Village, MA 02147. 48 p. 22 cm. [15 ref]  
• **Summary:** Contents: Introduction. Standard dietary recommendations. Recommended daily proportions. Foods to reduce or avoid for better health. Way of life suggestions. Daily reflections. Suggestions for patients with cancer or other serious illnesses. Special dishes. Home remedies. Baby food suggestions. Kitchen utensils. Nutritional considerations. East West Foundation information. Glossary. Bibliography.

Compiled with the help of Edward Esko, Murray Snyder, Bill Spear and Bill Tara. Address: Brookline Village, Massachusetts. Phone: -.

932. Nippon Shokuryo Shinbun-sha. 1982. Shokuhin sangyô jiten [Encyclopedia of the Japanese food industry. 3rd ed. 2 vols.]. Tokyo: NSS. 528 p. [Jap]

• **Summary:** Contains substantial entries for the following soy-related foods: Tofu and tofu products (p. 81-87), frozen and dried-frozen tofu (p. 96-97), natto (p. 98-101), and vegetable oils (p. 107-13). Address: Japan.

933. Re: Names of soyfoods around the world: French. 1982. Form filled out by William Shurtleff based on sources given below. 1 p. [Eng]

• **Summary:** Gives the names of the main soyfoods in French. Sources: Bernard Sturup; Bau & Debry, of France.  
“Soyfoods—Aliments à base de soja.  
Fresh green soybeans (edamamé)—Edamamé. Soja frais.  
Whole dry soybeans—(haricots de) Soja sec(s).  
Black soybeans -  
Fresh soy puree—Purée de soja.  
Soy sprouts—Pousses de soja. Soja germe.  
Soynuts—Soja grillé. Graines de soja grillées.  
Oil roasted soynuts—Graines de soja grillées (à l’huile).  
Soja grillé, revenu dans l’huile.  
Dry roasted soynuts—Soja grillé à sec. Graines de soja grillées à sec (or sans huile). Haricots de soja, grillés à sec.  
Soynut butter—Buerre de soja grillé.  
Roasted soy flour—Farine de soja grillé.  
Soy coffee—Cafe de soja.  
Soy chocolate—Chocolat de soja.  
Soy milk—Lait de soja—however it is not allowed on commercial products because of dairy lobby protests. Only “boisson au soja” or “jus de soja” can be used on commercial products.

Soy milk ice cream -  
Soy milk curds -  
Tofu (regular)—Tofu or Tofou (le).  
Soft tofu—Tofu mou.  
Firm Tofu—Tofu ferme. Extra firm tofu—Tofu très ferme.  
(Deep fried) Tofu cutlets—Tranches de tofu frites.

(Deep fried) Tofu burgers–Tofuburgers frits. Burgers de tofu (frits).

(Deep fried) Tofu pouches–Poches de tofu (frites).

Silken tofu–Tofu soyeux. Pressed silken tofu–Tofu soyeux.

Grilled tofu–Tofu grillé.

Dried frozen tofu–Tofu séché. Tofu déshydraté.

Okara or soy pulp–Okara (l’).

Yuba–Yuba (le).

Dried yuba sticks -

Sweet dried yuba -

Fermented black soybeans -

Miso or soybean jiang–Miso (le).

Soy sauce–Sauce de soja. Sauce soja. Shoyou (le).

Chinese sauces -

Tamari–Tamari (le).

Tempeh–Tempeh (le).

Fermented tofu–Tofu fermenté (au vin).

Fermented soymilk–Lait de soja fermenté.

Natto, thua-nao, kinema–Natto (le).

Soy oil–Huile de soja.

Soy lecithin–Lecithine de soja.

Soy flour–Farine de soja.

Whole (full fat) soy flour–Farine de soja entière.

Defatted soy flour–Farine de soja dégraissée.

Soy grits and flakes–Flocons et granule de soja.

Cereal-soy blends (CSM, WSB, etc.) -

Soy protein concentrate–Proteine de soja concentrée.

Soy protein isolate / Isolated soy protein–Isolat de proteines de soja. Proteine de soja isolée.

Textured soy protein products–Protéines de soja texturées (Produits à base de proteines de soja texturée).

Textured soy flour, TSF, or TSP–Farine de soja texturé.

Textured soy concentrates–Concentrat de soja texturé.

Textured soy isolate–Isolate de soja texturé.

Spun soy protein fibers–Address: Soyinfo Center, Lafayette, California 94549.

934. Reddy, N.R.; Pierson, M.D.; Sathe, S.K.; Salunkhe, D.K. 1982. Legume-based fermented foods: Their preparation and nutritional quality. *CRC Critical Reviews in Food Science and Nutrition* 17(4):335-70. [125 ref]

• **Summary:** Contents: 1. Introduction. 2. Soy sauce. 3. Tempeh. 4. Meitauza. 5. Miso. 6. Natto. 7. Sufu. 8. Fermented soybean milk and other fermented legume milk products. 9. Kenima [sic, kinema]. 10. Oncom (fermented peanut press cake). 11. Waries. 12. Papadams. 13. Dhokla. 14. Khaman. 15. Idli. 16. Dawadawa. 17. Other legume-fermented foods. 18. Future of legume-based fermented foods. References. Nutritional composition is given.

Concerning Dawadawa: Made from the cotyledons of the seeds of the locust bean (*Parkia biglobosa*) it “is also known as ‘kpalugu’ by the Kusasis and Dagombas of northern Ghana, ‘iru’ in Nigeria, ‘kinda’ in Sierra Leone,

and ‘netetou’ in Gambia.” It is a protein-rich, “strong-smelling product” that is used as a supplement in soups, stews, porridges, and dumplings. It can be stored without refrigeration for about a year in the tropics. It is eaten in all northern areas of the coastal nations of West Africa: Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Togo, Benin, Nigeria, and Cameroun, and in the tier of countries above these including Bissau, Gambia, Senegal, Mali, Upper Volta, Niger, and Chad.

Note 1. Soybeans are not mentioned in connection with dawadawa.

Note 2. The source of the misinformation about “kenima” is Batra and Millner (1976). Address: 1-2. Virginia Polytechnic Inst. and State Univ., Blacksburg, Virginia; 3. Univ. of Arizona, Tucson; 4. Mahatma Phule Agricultural Univ., Rahuri, Maharashtra State, India.

935. Reed, Gerald. ed. 1982. Prescott & Dunn’s industrial microbiology. 4th ed. Westport, Connecticut: AVI Publishing Co. xii + 884 p. Illust. Index. 23 cm.

• **Summary:** Chapter 12 (p. 492-538; 129 refs.), by H.L. Wang and C.W. Hesseltine, is titled “Oriental Fermented Foods.” It discusses: Soy sauce, miso, tempeh, ontjom, Hamanatto (known as tou-shih in China, tao-si in the Philippines, and tao-tjo in the East Indies [No! Tao-tjo is Indonesian-style miso]), sufu (also called Chinese cheese or bean cake), natto, idli, ang-kak, fermented fish products (incl. nuoc-mam), absence of mycotoxin in fermented foods, summary. Address: Vice president, Amber Labs, Milwaukee, Wisconsin.

936. Saono, S.; Winarno, F.G.; Karjadi, D. eds. 1982. Traditional food fermentation as industrial resources in ASCA countries. Jakarta, Indonesia: Indonesian Institute of Sciences (LIPI). xix + 259 p. Proceedings of a technical seminar, held 9-11 Feb. 1981 at Medan, Indonesia. No index. 28 cm.

• **Summary:** ASCA, the Association for Scientific Cooperation in Asia, was established in 1970. Each of the many interesting papers from this symposium that relates to soya is cited separately. Address: Indonesia.

937. Schlessinger, David. ed. 1982. Microbiology. Washington, DC: American Society for Microbiology. xi + 420 p. Illust. Author index. Subject index. 27 cm. [Eng]

• **Summary:** This book is divided into an introductory note (by Schlessinger) plus five parts. Part 1 (p. 3-77) is titled “The *Bacillus subtilis* chromosome: Structure, implication, modification and molecular cloning,” which is in turn divided into 19 chapters by various authors, as follows: 1. Isolation of *Bacillus subtilis* genes from Charon libraries. 2. Recombination between phage and plasmid vectors in *Bacillus subtilis*. 3. *Bacillus subtilis*  $\alpha$ -amylases: Regulation of production and molecular cloning. 4. Virulent

Phage  $\phi$ 1E1 $metB^+$ -mediated transduction dependent on transformation competence in *Bacillus subtilis*. 4. Construction of a *Bacillus subtilis* plasmid and molecular cloning in *B. subtilis*. 5. Ribosomal genes in *Bacillus subtilis*: Comparison with *Escherichia coli*. 6. Heterospecific gene expression. 7. Physical map of the rRNA genes of *Bacillus subtilis*. 8. RNA processing in *Bacillus subtilis*. 9. Structure and function of the region of replication origin in the *Bacillus subtilis* chromosome. 9. Is membrane association necessary for the initiation of chromosome replication? No. 10. Novel promoters on the *Bacillus subtilis* chromosome. 11. Mapping bacteriophage SP01 transcription. 12. Functions of *Bacillus subtilis* RNA polymerase core-associated polypeptides. 13. Molecular events during transformation in *Bacillus subtilis*. 14. Site-specific restriction endodeoxyribonucleases in Bacilli. 15. Genetic study of restriction endonucleases in *Bacillus subtilis*. 16. High frequency of recombination at a particular site of the phage M2 genome. Address: Mitsubishi-Kasei Inst. of Life Sciences, 11 Minamiooya, Machida-shi, Tokyo, Japan.

938. Tanaka, Teruo. 1982. Construction of a *Bacillus subtilis* plasmid and molecular cloning in *B. subtilis*. In: David Schlessinger, ed. 1982. Microbiology. Washington, DC: American Society for Microbiology. xi + 420 p. See p. 15-18. 27 cm. [17 ref. Eng]

• **Summary:** “My associates and I have elaborated seven classes of plasmids from 37 *B. subtilis* strains, including the *B. natto* strains used for fermentation of soybeans.” Address: Mitsubishi-Kasei Inst. of Life Sciences, 11 Minamiooya, Machida-shi, Tokyo, Japan.

939. Tsuruta, Shizuka; Nagayama, Hisao. 1982. *Nattô no hon: Tsukutte tabeyô* [The book of natto: Let's make and eat]. Tokyo: Bunka Shuppan Kyoku. 94 p. Illust. No index. 25 cm. [Jap]

• **Summary:** This attractive book, filled with color photos and recipes, is a popular and fun introduction to Japanese natto. There are also chapters on making natto at home using rice straw and making natto in a commercial factory. The words “The Nattow” are written on the cover in English. Note: The author translated *The Farm Vegetarian Cookbook* into Japanese.

940. Wang, H.L.; Hesseltine, C.W. 1982. Oriental fermented foods. In: G. Reed, ed. 1982. Prescott & Dunn's Industrial Microbiology, 4th ed. Westport, CT: AVI Publishing Co. xii + 883 p. See p. 492-538. Chap. 12. [129 ref]

• **Summary:** Contents: Introduction. Soy sauce. Miso. Tempeh. Ontjom. Hamanatto. Sufu. Natto. Idli. Ang-kak. Fermented fish products (esp. nuoc mam). Absence of mycotoxin in fermented foods. Summary. Address: NRRC, Peoria, Illinois.

941. Yoneda, Soei; Hoshino, Koei; Schuefftan, Kim. 1982. Good food from a Japanese temple. Tokyo, New York, and San Francisco: Kodansha International. 224 p. Illust. Index. 27 cm.

• **Summary:** An outstanding, beautiful book, the best seen to date on Buddhist Vegetarian Cookery (*shojin ryori*)—after you get past the poor, almost embarrassing introduction, written by Robert Farrar Capon of New York. The author, Sôei Yoneda, is a great Zen Abbess and cook, and a visit to Sankô-in, a Rinzai nunnery, is an unforgettable experience. The recipes are arranged by season: Spring, summer, autumn, winter, all seasons. For every recipe, both a Japanese and an English-language name are given. Soy-related recipes include: Soybean rice (*mame gohan*, p. 73). Unohana rice (with fried okara, p. 75). Thick-rolled sushi (with dried-frozen tofu, p. 75). Tofu rice (p. 80). Soy bean dashi (p. 82). Miso soups (p. 85-88; 14 recipes, one for each month but two for Jan. 1 and 2—White miso Ozoni and Zen temple ozoni—and one for all seasons—Saké lees soup). Pickling with miso (p. 89). Rape blossoms with miso-mustard dressing (p. 93). Bamboo shoots with vinegar-miso dressing (p. 98-99). Quick oden (with tofu, p. 107-08). Green beans with miso dressing (p. 113-14). Eggplant with miso sauce (p. 123). Zucchini with sesame-miso sauce (p. 129). Steamed zucchini with three-color miso (p. 130-31). Jade nuggets (*kizami nattô no ao-jiso age*, p. 136). Pine cones (*matsukasa*, with tofu, p. 151). Miso-pickled vinegared konbu kelp (p. 153). Crisp turnip with sesame-miso dressing (p. 158). Amazake (p. 162). Daikon with miso sauce (*daikon oden*, p. 170). Brussels sprouts with miso sauce (p. 179-80). Dried-frozen tofu mélange (p. 181-82). Not exactly hamburger (“patties” with dried-frozen tofu and okara, p. 182). Simmered dried-frozen tofu (p. 182-83). Dried-frozen tofu tempura (p. 183). Konnyaku in miso dressing (p. 184). Fried unohana (*iri unohana*, with thin deep-fried tofu and okara, p. 187; “The mash or lees (*okara*) remaining after making tofu are inexpensive, plentiful, and nourishing—ideal everyday temple food. By itself *okara* is not interesting, but it is brought to life by the addition of a little oil and a few other ingredients”). Inari-zushi (p. 189-90). Grilled usuage (with thin deep-fried tofu, p. 190). Deep-fried usuage (p. 190-91). Golden sushi rolls (with usuage, p. 191). Rôbai (Sanko-in fresh wheat gluten, p. 192-93). Deep-fried dried yuba (p. 195). Fried and simmered dried yuba (p. 196). Sesame “tofu” (with kuzu, p. 196-99). Almond tofu (p. 202). Salt-grilled tofu (from old Naniwa, today's Osaka, p. 203-04). Steamed tofu loaf (p. 206). Salad with white [tofu] dressing (*shira ae*, p. 206-07). Steamed tofu cup (*otôfu no chawan mushi*, p. 208). Deep-fried tofu in thick sauce (p. 209). Tofu sauté (*yaki-dofu no atsuyaki*, p. 213). Bean flowers (*nattô no mochi gurumi*, p. 215). Buckwheat-miso topping (p. 215-16). Miso mayonnaise (with sweet white Saikyo miso, p. 216-17). Contains 17 pages of color photos showing dishes prepared from recipes in this book. The 510 delicate illustrations



(both line drawings and simple brush paintings) clarify and enhance the text throughout.

In 1987 this book was re-issued with a new title: *The Heart of Zen Cuisine: A 600-year Tradition of Vegetarian Cookery*. Address: 1. Abbess, Sanko-in Zen temple, Honcho 3-1-36, Koganei-shi, West Tokyo (Musashi Koganei Station).

942. Sheraton, Mimi. 1983. Restaurants: Japanese fare for theater nights. *New York Times*. Jan. 14. p. C18.

• **Summary:** This is a review of Sushiko, a Japanese restaurant at 231 West 55th St., between Broadway and Eighth Ave. in New York City. They sell: “fried half-eggplant mellowed with miso sauce, topped with sesame seeds; soybean cakes [tofu] in seaweed soup with vegetables; oshitashi [o-shitashi, o-hitashi], a salad of marinated spinach with soy sauce and crunchy flakes of dried bonito, and natto, winy, fermented soybeans in an egg and scallion sauce.”

And “zaru soba, cold buckwheat noodles with soy sauce, horseradish and scallions were refreshing.” “Broiled fish, meats and poultry, done teriyaki-style are stringy and less interesting...”

943. Pantry Supermarkets. 1983. Buy one, get one free! (Ad). *Los Angeles Times*. Jan. 20. p. SG3.

• **Summary:** The section titled “Oriental foods” states: “Hinode shirataki (yam noodles) 9 oz.–50¢. Hinode natto (steamed soybeans) 5 oz.–49¢. Hinode Japanese tofu 19 oz.–59¢.” Address: Los Angeles Co. and southern California.

944. Leonard, Thom. 1983. Pioneering work with miso in America (Interview). *SoyaScan Notes*. Feb. 12. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** In the fall of 1974, Thom Leonard made his first batch of barley koji and barley miso using a recipe in Herman Aihara’s new book titled *Soybean Diet*. The 80-pound batch of miso was aged in a soy sauce keg from Hong Kong. He then made 80-pound batches of chunky wheat miso in the fall of 1975 (he later pickled tofu in it) and of barley miso in early 1976. After moving to Fayetteville, Arkansas, he and Jim Hemminger made larger scale miso equipment and on 15 April 1977 packed their first 35-gallon cedar vat with brown-rice miso. Soon over 1,000 lb were aging in the vats. This miso was sold to and distributed by the Ozark Cooperative Warehouse.

Thom and Richard Kluding founded the first Caucasian-run miso company in North America, Ohio Miso Co. in Monroeville, Ohio. They began production on 13 March 1979. By Jan. 1980 Ohio Miso was making several varieties of miso: brown rice, barley (one or two year), mellow brown rice, mellow red, and black soybean; output was 2,400 lb/week.

Then in the spring of 1980 Leonard and Kluding split up, largely because of interpersonal problems. In the summer of 1980 Leonard taught miso classes at the macrobiotic

Spiral Inn and Moniteau Farm in Missouri. Then in late 1980 he taught 2 classes on making miso, natto, tofu, and tempeh at the Kushi Institute in Boston, Massachusetts, with 30-40 people per class. In 1981 and 1982 he taught 8 similar classes out of his home in Boston, plus four 3-day residential workshops on the same subjects. All were sold out every time. In 1983 he plans to travel Ireland to start a miso plant in County Kilkenny. Friends of his own several old buildings. The Irish government will help pay startup costs, covering 45% of the required startup capital plus 25% of the rent for the first 5 years. He hopes to start in July 1983 and be producing miso by late 1983. He hopes to make 100,000 to 200,000 pounds of mostly barley miso, both mellow barley and 12-24 month barley miso. Thom’s constitution is so yang that he can’t eat much miso—which is also very yang. But this week he enjoyed miso soup twice, which is more than he has had for the past year.

Note: Thom and his wife went to Ireland but they never started a miso plant or commercial miso production there. Address: Brookline, Massachusetts.

945. Ebine, Hideo. 1983. Re: Dipicolinic acid and retirement from the National Foods Research Institute, Japan. Letter to William Shurtleff at Soyfoods Center, Feb. 22. 1 p. Typed, with signature. [Eng]

• **Summary:** Note: *The Book of Miso*, by Shurtleff and Aoyagi (1976) states (p. 26): “In 1972, a number of Japanese scientists doing agricultural research stimulated by Dr. [Shinichiro] Akizuki’s writings discovered a substance in miso which they called Zybicolin. Produced by miso and natto yeasts, it has the ability to attract, absorb, and discharge from the body radioactive elements such as strontium. The discovery received front-page coverage in all of Japan’s major newspapers.” Yet Shurtleff never cited the actual article—in part because he learned of it just as *The Book of Miso* was about to go to press.

Director Ebine has tried to locate the article mentioned above but has not been able to find it—and he has never heard of it, although he has long been a miso research scientist. Zybicolin is probably “dipicolinic acid,” which is found in miso and natto, and which has a strong combining activity to minerals including radioactive minerals such as strontium.

Ebine retired from the National Food Research Institute (NFRI) in March 1982 and immediately (in April 1982) began his present work as director of the Central Miso Research Institute. Address: Director, Central Miso Research Inst., Shinkawa 1-24-19, Chuo-ku, Tokyo 104, Japan.

946. Abiose, Sumbo. 1983. Re: Soy ogi and other soyfoods in Nigeria. Letter to William Shurtleff at Soyfoods Center, Feb. 23—in reply to inquiry. 1 p. Typed, with signature on letterhead.

• **Summary:** Soy-ogi is not yet on the market as a commercial product, according to the Federal Inst. of

Industrial Research, Oshodi, where Dr. Akinrele worked. An agreement was made with Nestle's Foods (Nigeria) Ltd. for commercialization but this fell through. About one month ago a new agreement was made with an indigenous company which will now hopefully commercialize the product.

"Apart from soy-ogi, nothing as far as I know is being done with soy foods in Nigeria. I am working presently on fermented *Parkia filicoidea* (African locust bean). The local name of the product is 'Iru'. A part of the work involves using soybeans as substitute raw material instead of locust beans." Address: Dep. of Food Science & Technology, Univ. of Ife, Ile-Ife, Nigeria. Phone: Ife 2291.

947. Pantry Supermarkets. 1983. Double coupons! (Ad). *Los Angeles Times*. Feb. 24. p. SG3.

• **Summary:** The section titled "Oriental foods" states: "Hinode natto (steamed soybeans) 5 oz.-49¢. Hinode Japanese tofu 19 oz.-59¢. Hinode kinugoshi tofu 12 oz.-59¢. Hinode Chinese tofu 20 oz. 59¢. Sisco koji miso 1 lb.-\$1.25. Kokuho Rose rice 15 lb. bag-\$7.99."

Note: The Pantry has 11 supermarkets in southern California: Pasadena (3), Duarte, Placentia, Arcadia, Santa Ana, Fullerton, Tustin, Costa Mesa, and Monrovia. Address: Los Angeles Co. and southern California.

948. *Soyfoods*. 1983. Soyfoods mini-boom underway in Europe. Winter. p. 8-9.

• **Summary:** "'This year we became aware that the kind of developments that took place in the U.S. in 1977-78 are now taking place in Europe with the sudden increase in the number of soyfoods companies,' reports Bill Shurtleff of The Soyfoods Center. 'Historically speaking, this will probably be the most important event for the soyfoods industry in 1982. Europe is coming on strong and it's a tradition of soyfoods that goes back 130 years that is now being revived.'

"Most of the impetus for soyfoods in Europe apparently stems from the vigor of the macrobiotic community. Per Fruergaard started Tofu Denmark in Valby and has encountered legal problems regarding the use of nigari. In Paris, France, Bernard Storup purchased a Takai tofu system; Ab and Paulien Schaft are setting up a small plant in Baillestavy to make miso, shoyu, natto, and koji; in Ivory, Jean Luc Alonso's macrobiotic center, Traditions du Grain, prepares for tempeh production.

"In the British Isles, Paul Jones' Tofu Shop in London, England, has been active since 1981 while Community Health Foundation, also in London, promotes homescale tofu, tempeh, and misomaking. In Dublin, Ireland, Jane O'Brien gives tofu cooking classes, has published a tofu cookbook and is considering commercial production.

"The macrobiotic movement is strong in Belgium where de Brandnetel, a large Antwerp-based distributor of natural foods, operates a tofu shop in the rear of their retail store. Jonathan Company in Ekeren makes 3000 pounds of tofu

weekly, along with seitan, mochi, soups, canned foods, and soymilk. Seven Arrows in Leuven is another small tofu shop in operation.

"In the Netherlands Manna was the first company to introduce soyfoods to the public and is now an important promoter. Manna's John Welters (who provided much of this information) lectures on homescale soy processing and reports interest and sales are rising as are the number of magazine articles on soyfoods. Manna itself markets tofu spreads and distributes a joint equipment price list with Takai Company of Japan. Witte Wonder in The Hague makes tofu, as does De Morgenstond in Bakkeveen, while Peter Dekker's Jakso produces tempeh. In Portugal, Unimave promotes soy as part of the macrobiotic diet and makes small amounts of tofu and soymilk; Jose Parracho in Setubal is starting a self-sufficient center involving tofu and tempeh production.

"In Soyen, West Germany, Wolfgang Furth-Kuby, who published *Das Tofu Buch* (by William Shurtleff) in German, is interested in tofu production at his Sojaquelle. Tofu producers are Swame [sic, Swami] Anand Svadesha in Furthim-Wald, Thomas Kasas [sic, Karas] who installed a tofu system last summer at his Bittersuess [later Soyastern] in Cologne, and Alexander Nabben in Munich.

"In Sweden Tim Ohlund and Ted Nordquist have been operating Aros Sojaprodukter since early 1981 in Örsundsbro using a Takai pressure cooker system and vacuum packaging. In Rimini, Italy, Gilberto Bianchini makes tofu at Community Foods. And Switzerland is the home of four soy companies including Restaurant Sesam in Bern, an active macrobiotic center with homescale tofu and seitan production; Marty Halsey makes tofu in Nyon; Hans Opplinger produces tofu in Chan; and Verena Krieger operates Sojalade in Luzern (Lucerne).

"Sojalade, whose tofu output at mid-summer 1982 was 1000 pounds weekly, is a company launched mainly on the results of an article Ms. Krieger published ('Yesterday Steak, Tomorrow Tofu') in a Swiss Sunday magazine. Krieger then established her shop to meet the expected tofu demand stirred up by her article. Swiss national television ran a 30 minute feature on soybeans this year in which Krieger made a brief demonstration of 5 tofu dishes. 'Since then tofu has been a favorite child of the media,' she says, adding that tofu appeared in the pages of *Blick*, a mass market newspaper."

Photos show: (1) European representatives at the international Soyfoods Come West conference in Seattle, Washington: Gilberto Bianchini, Marina Casazza (Italy); Joanna White (Switzerland); Kym Olsen (England); Wolfgang Furth-Kuby (W. Germany); Tim Ohlund (Sweden); Roger Kayes (England). (2) Ted Nordquist and Tim Ohlund of Aros Sojaprodukter, Sweden's first tofu company.

949. Taira, Harue; Takagi, Hideo; Kokubun, K.; Koyama, S.; Hoshino, S.; Miyauchi, N. 1983. Kokusan daizu no hinshitsu. II. Futsû hatake to suiden tenkan saibai daizu

shijitsu no kagaku seibun sosei oyobi kakô tekisei no sai [Quality of soybean seeds grown in Japan. II. Differences in the chemical composition and suitability for food processing between upland and drained paddy field cultures / crops]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 41. p. 14-33. Feb. [33 ref. Jap; eng]

• **Summary:** The chemical composition and suitability for making tofu, miso, natto and cooked whole soybeans were investigated with 78 seed samples of 31 varieties which were grown in upland and drained paddy fields at five Agricultural Experiment Stations in 1980.

The qualities tested were chemical composition (moisture, protein, and oil content) and suitability for food processing as measured by weight of 100 seeds, weight increase ratio of soaked seed, germination ratio, solid matter content of soaking water, solid matter extractability, pH, color of soybean milk, weight increase ratio by steaming, moisture content, softness, and color of steamed seeds. Drained paddy field cultivation, as compared with upland cultivation, gave high moisture and heavy weight of 100 seeds, and low  $x$  color value of soybean milk and steamed soybean seeds.

From the results of contribution ratios, it was shown that the moisture content of soybean seeds was influenced by cultural conditions, whereas the chemical composition of protein and oil, and all the suitabilities for food processing were influenced by variety. Address: 1. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305; 2. Hokkaido Agric. Exp. Station, Hitsujigaoka, Sapporo, Hokkaido; 3. Tohoku National Agric. Exp. Station, Kariwano, Akita; 4. Hokuriku National Agric. Exp. Station, Joetsu, Niigata; 5. Niigata Agric. Exp. Station, Nagaoka, Niigata; 6. Ehime Agric. Exp. Station, Dogoichiman, Matsuyama, Ehime. All: Japan.

950. *Toyo Shinpo (Soyfoods News)*. 1983. Issetai atari nenkan oyobi ikkagetsu-kan no hinmoku-betsu shishutsu kingan [Amount of money spent and amount of soyfood products consumed per household per year and per month in Japan, 1977-1982]. March 1. [1 ref. Jap]

• **Summary:** Gives figures for tofu, ganmodoki, natto, other, shoyu, miso, soy oil, and margarine. Tofu consumption is lowest in February and highest in August, followed by July, May, and June. Natto consumption is highest March then February, and lowest in August. Shoyu consumption is highest in July then May, and lowest in January then February. Miso consumption is highest in April then May, and lowest in January. Soy oil consumption is highest in July and lowest in January. Address: Japan.

951. Parker, Joyce. 1983. Re: Soyfoods and soybeans in Nepal. Letter to William Shurtleff at Soyfoods Center, March

5. 3 p. Handwritten with signature on letterhead of the Britain Nepal Medical Trust (Koshi Anchal).

• **Summary:** She is a Peace Corps volunteer living in the eastern middle hills of Nepal. In late October she took a 6-week vacation trekking into the Himalayas in the Mt. Everest region. "A truly magical vacation. Lots of physical work but no mental pressure (only getting over the next pass). Incredible country—so spiritual—the gods really do live there!—a total mental peace overcame me—whether that was due to lack of oxygen I don't know but the experience was indescribable—wonderful.

"From what I can gather from the people in my area (Newars) kenima is considered a very low-caste food—eaten only by those that can't afford pure white, pressed rice—and by people of Limbu origin. Newars & Brahmins (the ruling folks) wouldn't even touch it, let alone know how to make it. Dietary customs are quite strange. To make 'beaten rice': Roast rice in the husk in a dry pot, stirring constantly. Remove and place in a *deki* (a wooden machine with a pounding weight on one side attached to a flat paddle on the other—very similar to a western child's seesaw) where the husks are removed. It is then picked over to remove rocks & debris by means of a large flat bamboo basket (*nanglo-caralan*). The rice is tossed in the air—it takes quite a skill to move it about—so the heavy objects fall to one side and the lighter objects (husks etc.) fly into the air and are blown away. Then the rice is put into a large wooden mortar and pestle and beaten until it becomes flat. It can now be eaten as is, with a bit of milk or tea or vegetables, etc. I add it as a filler to my 'nut roasts.'

"March 5—I still have not made it to the Limbu village. But to my surprise, while shopping for food at the weekly "haat bazaar" I came across an old woman selling the stuff called kenima. It was in a large basket—huge mass of soybeans. The soybeans had remained in their usual shape, only halved. It has a foul, sour smell to it. But I bought some, much to the surprise of the old woman. She told me to cook it up with a soup I don't know if one can eat it as is—because it was covered with flies. I thought it best to try to make it safe by boiling it. Well the soup had a funky taste that wasn't too appealing. The texture of the soybeans was soft and sticky before I cooked them. Jeff has told me that the Limbus eat it in this manner and they make an *achar* (pickle) from it using chili (*korsanni*) and other spices. I have not seen kenima in its dry form." Address: c/o U.S. Peace Corps, P.O. Box 613, Kathmandu, Nepal.

952. *SoyaScan Notes*. 1983. How to eat natto (Overview). March 22. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** David and Suzanne Greenslade: The only way they ever ate natto in Japan was: Put 1 packet of natto in a bowl. Add 1 raw egg, 1 tablespoon shoyu [Japanese-style soy sauce], and ¼ minced green onion (*negi*). Stir vigorously

with chopsticks. Pour over hot rice and eat. OK to mix with the rice. It was served that way all over Japan and in Los Angeles.

Akiko Aoyagi Shurtleff, who was born and raised in Tokyo, never ate natto this way. She added to the natto: *katsuobushi* (shaved, dried, fermented and smoked skipjack tuna {*Katsuwonus pelamis*, sometimes referred to as bonito}), minced green onion, shoyu and Japanese-style mustard {*karashi*}).

In the Japan's northeast prefectures (*Tôhoku Chihô*) Akiko has heard that some people use sugar instead of soy sauce.

953. Sheraton, Mimi. 1983. Restaurants: Sushi and sashimi, the best in the city. *New York Times*. April 15. p. C1-2.

• **Summary:** This is a review of Hatsuhana, a Japanese restaurant at 17 East 48th St., between Fifth and Madison Ave. in New York City. "Natto, a combination of raw fish with an earthy cheeselike paste of aged soy beans, is wonderful whether you have it with a white-flesh fish, tuna, clams, squid or the most subtly flavored toro—fatty tuna. A sunny yellow vinegar sauce made of lemon juice, bean paste [miso] and sake is the basis of nuta, a salad made with plain or fatty tuna, white fish, clams or squid."

"The eye-opening wasabi horseradish should be mixed into soy sauce before sushi and sashimi are dipped in, and lacy slivers of radish [daikon] add a nice contrast."

954. *Yomiuri Shinbun* (*Yomiuri Daily News, Tokyo*). 1983. Niowanai nattô [Natto that doesn't smell: Tempeh]. May 20. Evening ed. p. 14. [Jap]

• **Summary:** Tempeh is very different from natto: it is fermented with a mold, whereas natto is fermented with a bacterium. Natto is indigenous to Japan, whereas tempeh is indigenous to Java, and neither is widely consumed in the country of the other. Yet both are fermented soyfoods.

Natto is growing more popular as a breakfast food in Japan—related to the growing interest in natural foods, vegetable protein, and riding the same wave of popularity as soymilk. Young people are eating less rice. In 1982 each family in Japan spent ¥1,531 on natto, up 12% from the previous year. Dr. Teruo Ohta says one reason Japanese have the greatest longevity is because they eat a lot of plant protein instead of animal protein. Representative of these plant protein foods are soyfoods. But miso and shoyu contain salt, and tofu and soymilk contain no dietary fiber. Natto (like tempeh) is doubly good in that it contains fiber but no salt.

But the rice Japanese usually eat with natto is steadily decreasing; will this eventually cause a decrease in natto consumption as well? Maybe only those older than middle age are the main natto consumers.

This article uses the term "tempeh natto" three times. Note: We think this is unfortunate and confusing. Last year

Dr. Ohta visited natto plants in Indonesia. Medical research shows natto is good for health.

Did natto originate in China? Was that Chinese natto salted or not? Was it disseminated by Buddhist monks to Japan and Southeast Asia?

Next month the Japanese National Natto Association will send a delegation to Java (Indonesia) to study tempeh.

955. *Zenkoku Shokuhin Shinbun* (*National Food News*). 1983. Nattô Kenkyû-kai no kappatsu na katsudô (nattô-kin tenpe) o Zennôren tsûjô sôkai [The Natto Study Group's vigorous activity (with "tempeh natto") at the Japan Natto Association's general meeting]. No. 452. May 21. [Jap] Address: Japan.

956. Ikawa, Kazuhisa. 1983. Higashi Ajia fukugo bunka-ken. Tôfu bunka to nattô no toraianguru [East Asia's culture complex. Tofu culture and the natto triangle]. *Asahi Shinbun* (*Asahi Daily News, Tokyo*). May 28. p. 11. [Jap]

957. Ikawa, Kazuhisa. 1983. Ajia fukugô nattô-ken: Tôfu bunka to Nattô toraianguru [Asia's multi-combined natto zone: Tofu culture and the natto triangle]. *Mainichi Shinbun* (*Mainichi Daily News, Tokyo*). May 28. p. 11. [Jap] • **Summary:** Contains three maps showing the "natto triangle." The three points on the triangle lie at Japan (natto), Java (tempeh), and Bhutan + eastern Nepal (kinema).

Note: All these foods are un-salted, however tempeh is fermented with a mold whereas natto and kinema are both fermented with bacteria. Therefore, Java should not be part of the "natto triangle."

958. Hara, Toshio; Ueda, S.; Sakaki, Y. 1983. Restriction endonuclease mapping of pUH1 in *Bacillus subtilis* (natto): Note. *Agricultural and Biological Chemistry* 47(5):1143-44. May. [14 ref]

• **Summary:** Figures show: (1) "Agarose gel electrophoresis of fragments of pUH1 digested with two restriction endonucleases."

(2) A "restriction endonuclease cleavage map" of the circular plasmid pUH1. There are ten cleavage points.

Note: This is the earliest document seen (Jan. 2012) that shows this remarkable circular illustration of a plasmid, a type of DNA which is separate from the chromosomal DNA and which is capable of replicating independently of the chromosomal DNA. Address: 1-2. Dep. of Food Science & Technology, Faculty of Agriculture, Kyushu Univ., Hakozaki, Fukuoka 812, Japan; 3. Research Lab. for Genetic Information, Kyushu Univ. School of Medicine, Maedashi, Fukuoka 812, Japan.

959. Hesseltine, C.W. 1983. Food fermentation research and development. In: K.T. Achaya, ed. 1983. Proceedings of AHARA 82, First AFST (I) International Conference on

Food Science and Technology. See p. 65-67. Held 23-26 May 1982 at Bangalore, India.

• **Summary:** Discusses the amounts of miso, shoyu, and natto produced in Japan. In Korea in 1978 an estimated 51,237 metric tons of soybean paste, 97,830 kiloliters of soy sauce, and 33,525 metric tons of gochoojang (hot pepper paste) were produced. Also discusses the amounts of tofu, tempeh, and miso made in the USA. Address: USDA, Peoria, Illinois.

960. Steinkraus, Keith H.; Cullen, R.E.; Pederson, C.S.; Nellis, L.F.; Gavitt, B.K. eds. 1983. Handbook of indigenous fermented foods. New York, NY: Marcel Dekker. ix + 671 p. May. Illust. Index. 26 cm. Microbiology Series, Vol. 9. [200+ ref]

• **Summary:** Contents: Foreword by E.J. Da Silva. Preface. 1. Indonesian tempeh and related fermentations: Protein-rich vegetarian meat substitutes. 2. Indigenous fermented foods involving an acid fermentation: Preserving and enhancing organoleptic and nutritional qualities of fresh foods.

3. Indigenous fermented foods in which ethanol is a major product: Types and nutritional significance of primitive wines and beers and related alcoholic foods.

4. Indigenous fermented amino acid / peptide sauces and pastes with meatlike flavors (p. 433-571): Introduction.

(A) Soy sauces: Japanese shoyu: Koikuchi, usukuchi, and tamari; Chinese chiang-yu, by Tamotsu Yokotsuka (p. 437-51). Taiwanese soy sauce, by Liu (p. 451-56). Malaysian soy sauce: Kicap, by Ong, Mercian, Poesponegoro and Tanuwidja (p. 456-61). Indonesian soy sauce: Kecap, by Saono, Poesponegoro and Tanuwidja (p. 461-65). Korean soy sauce, by Chang (incl. homemade kanjang and meju, p. 465-66). Taiwanese black bean sauce: Inyu, by Jan et al. (p. 466-67). Philippine taosi [fermented black soybeans], by Steinkraus (p. 467).

(B) Fermented soybean pastes: Japanese miso, by Ebine, Shurtleff and Aoyagi (p. 468-79). Indonesian tauco, by Saono et al. and Winarno (p. 479-82). Korean Doenjang and kochujang, by Chang, Shurtleff and Aoyagi (p. 482-87).

(C) Fermented fish-shrimp sauces and pastes (p. 487-526).

(D) Fish-soy sauce and fish-soy paste, by Ismail (p. 526-30).

(E) Miscellaneous Oriental fermentations. Japanese natto (itohiki natto), by Hayashi and Ota (p. 530-45). Japanese Hama-natto (hamanatto) and related products (incl. yukiwari natto, p. 545-47). Chinese red rice: Anka (Ang-kah [ang-kak, angkak]), by Lin, Su and Wang, Sooksan and Gongsakdi, and Pichyangkura (p. 547-53). Chinese sufu, by Su and L.-P. Lin (incl. nyufu, p. 553-61). Note: Chapter 4 contains about 195 references.

5. Mushrooms: Producing single cell (microbial) protein on ligno-cellulosic or other food and agricultural wastes.

6. General papers related to indigenous fermented foods: Contributions of the western world to knowledge of

indigenous fermented foods of the orient, the importance of microbial genetics in indigenous food fermentations, new uses for traditional food fermentations, mycotoxin problems in indigenous fermented foods and new methods for mycotoxin analysis.

Less widely known fermented foods include: Idli, dosa/dosai, dhokla (with soy, 131-35), enjera (162), tef/teff (164), wot (165), hopper (173), kishra (175), lambic (179), ogi (with soy, 189-98), mahewu (203), gari (208), dahi (249-57), srikhand and lassi (256-57), laban rayeb, laban zeer, yogurt (257-59; cultured soy yogurt is mentioned on p. 616), liban, mast, mass, taw (260), tairu (with soy, 260-65), kishk or kushuk (267), Metchnikoff (266), trahanas or tarhanas (271-76), rabdi, jalebi (275), koumiss (276), kefir (277-80).

Alcoholic beverages and foods: Honey wine, mead, metheglin (305), tej (306), sugar cane wines, basi, bubod, binubudan (307), palm wine or toddy (315-28), pulque (328-37), kaffir (344), tesguino (352), bouza (357), pito (358), busaa (365) sake (373-79), yakju and takju (379), tape = tapeh (381-400), ragi (381), tapuy (400), lao-chao (402), madhu (406), brem (408), tropical vinegar (410-14), nata (414-20), tea fungus (421), nuoc-mam (516-21).

Reviewed in Scientific American (Nov. 1983, p. 37), and in Bio/Technology (1984, p. 364). Address: Inst. of Food Science, Cornell Univ., Geneva, New York.

961. Herrmann, Karl. 1983. Ueber Sojabohnen und Sojaprodukte [On soybeans and soybean products]. *Ernaehrungs-Umschau* 30(6):175-79. June. [17 ref. Ger]

• **Summary:** Contents: Introduction, nutritional composition, amino acids in soy sauce. Unfermented soy products: Soymilk, tofu (*sojaquark*), aburage, kori-tofu, yuba, kinako. Fermented soy products: Soy sauce, miso (*sojapaste*), tempeh, sufu, natto. Address: Institut fuer Lebensmittelchemie, Hannover Univ., Wunstorfer Str. 14, D-3000 Hannover 91 [West Germany].

962. Obeta, J.A.N. 1983. A note on the micro-organisms associated with the fermentation of seeds of the African oil bean tree (*Pentaclethra macrophylla*). *J. of Applied Bacteriology* 54(3):433-35. June. [10 ref]

• **Summary:** The resulting fermented food is popularly known as "Ugba" among the Ibo people of Nigeria. It is an important and inexpensive source of protein for these people whose staple foods are deficient in protein. The process is thought to date from prehistoric times, although its origin has never been documented. Address: Dep. of Microbiology, Univ. of Nigeria, Nsukka, Nigeria.

963. Kanasugi, Goro. 1983. Re: Thanks for meeting with the Natto Association in Japan to discuss tempeh. Letter to William Shurtleff at Soyfoods Center, July 5. 1 p. Handwritten, with signature. [Jap]

• **Summary:** On 2 July 1983 an interesting meeting was

held at the Natto Association headquarters in Tokyo, Japan. Five leaders of the Association, Dr. Teruo Ohta and Kiyooki Katoh from the National Food Research Institute (NFRI), William Shurtleff from Soyfoods Center, and Mrs. Yasuko Torii (author of books on natural foods and farming) met for 6 hours to discuss developments with tempeh in the USA and strategies and tactics for introducing tempeh to Japan. This is a thank-you note for attending that meeting and the dinner afterwards. Address: Shimo-cho 3-6, Omiya-shi, Saitama-ken 330, Japan. Phone: 048-644-1323.

964. *Zenkoku Shokuhin Shinbun (National Food News)*. 1983. Shisatsu Haken-in kikoku hōkoku Zennōren Tenpe kenkyū-kai [The Japan Natto Association's Tempeh research group presents its homecoming report after being sent to study tempeh]. No. 456. July 11. p. 6. [Jap]

• **Summary:** On 18 June 1983 the group had a regular meeting and listened to the report of the tempeh study group that has just returned from Indonesia. Mr. Ose, the chair, told the members that it is unfortunate that the mass media are doing stories on tempeh before it is firmly established in and adapted to Japanese culture. He asked members of the group to please refrain from publicizing tempeh before it is ready.

965. **Product Name:** [Dried Natto].

**Foreign Name:** Hoshi Nattō.

**Manufacturer's Name:** Azuma Shokuhin K.K.

**Manufacturer's Address:** Tochigi-ken, Japan. Phone:

0268-24-9313.

**Date of Introduction:** 1983. July.

**Ingredients:** Soybeans.

**Wt/Vol., Packaging, Price:** 80 gm. in plastic bag. Retails for ¥180 in Tokyo (July 1983).

**How Stored:** Shelf stable, 6 month shelf life.

**New Product–Documentation:** Product with Label purchased in July 1983 by William Shurtleff at a department store in Tokyo, Japan. The label, printed black on red, is 1.75 by 4.5 inches wide on each side. The total package is 6 by 5 inches. Shelf life: 6 months. How to store: Keep in a sealed glass jar.

Back panel. Dried natto (*hoshi nattō*) has existed in Japan since ancient times. (Note: Natto was probably made in farmhouses, then sun-dried to preserve it). Now we make it in a modern factory. Eat it as *ochazuke* (put it atop a bowl of rice, then pour tea over it), or with beer. Or store it as an emergency food.

Note: As of Jan. 2012 the dry natto is still in the plastic bag, and smells fine.

966. **Product Name:** [Yukiwari Natto].

**Foreign Name:** Yukiwari Nattō.

**Manufacturer's Name:** Maruyone Shokuhin Kogyō K.K.

**Manufacturer's Address:** 1040-2, Kubota, Kubota-cho, Yonezawa-shi, Yamagata-ken, Japan. Phone: Yonezawa 0238 (main), (37) 2111-3.

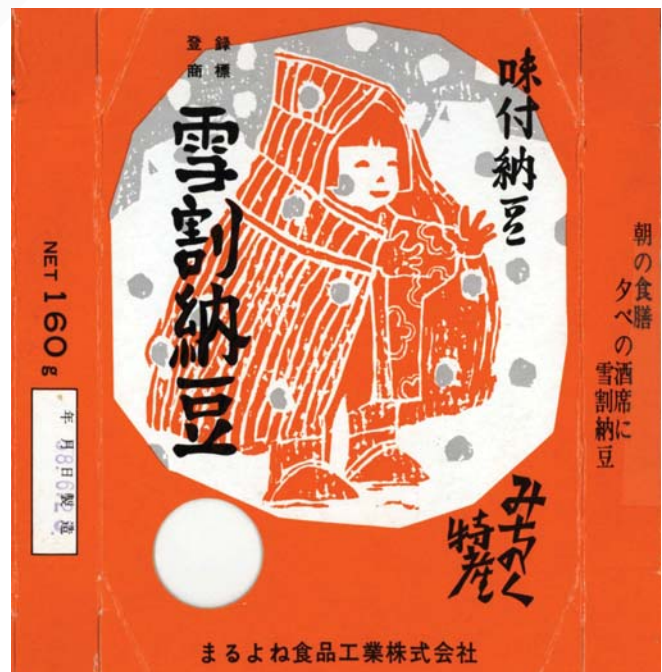
**Date of Introduction:** 1983. July.

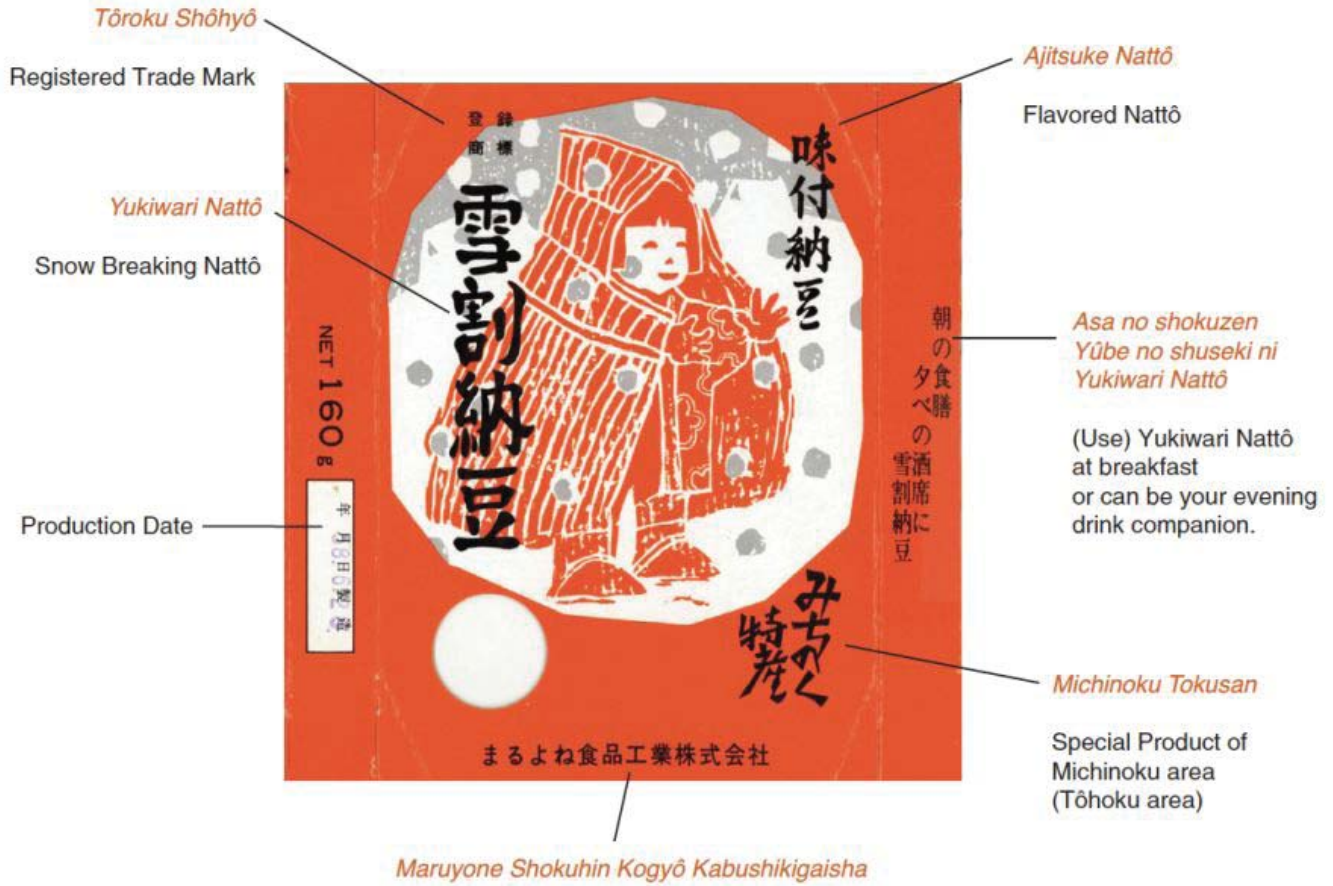
**Ingredients:** Soybeans.

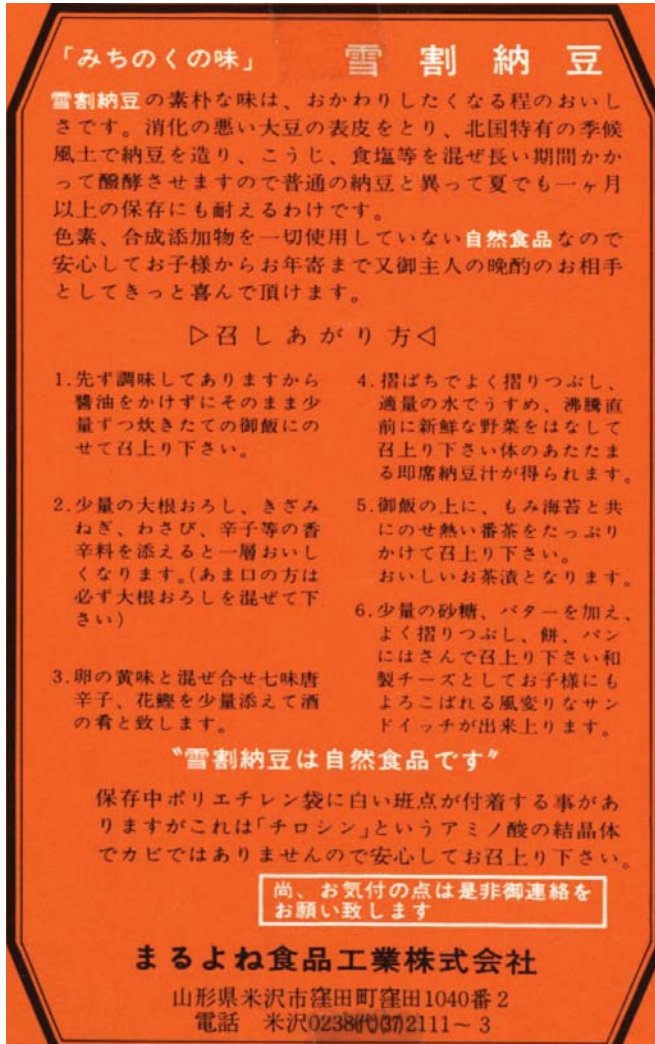
**Wt/Vol., Packaging, Price:** 160 gm. Retails for ¥180 in Tokyo.

**How Stored:** Refrigerated.

**New Product–Documentation:** Product with Label







purchased in July 1983 in Tokyo. Black and white on orange background. Paperboard box. Surprisingly, no ingredients are listed on the package. However the ingredients are probably water, soybeans, natto starter (*Bacillus subtilis*), rice (made into koji using *Aspergillus oryzae* mold culture), and salt.

The front panel reads: Upper left, 4 small Chinese characters: Registered trademark (*tôroku shôhyô*). Down left side, 4 large bold Chinese characters: Yukiwari Natto (“snow-breaking natto”). Down upper right, 4 medium-size Chinese characters: Flavored / seasoned natto (*ajitsuke nattô*). Down far right, many small Chinese characters: Use yukiwari natto at breakfast, or it can be your evening drink companion (*Asa no shokuzen. Yûbe no shuseki ni Yukiwari Natto*). Lower right, 6 medium size characters: Special product of the Michinoku area [Yamagata prefecture, northeast prefectures (Tohoku Chiho), Japan] (*Michinoku tokusan*). Across the bottom, in many small characters is the name of the manufacturer, Maruyone Shokuhin...

The back panel reads: Taste of Michino-ku, Yukiwari Nattô.

The simple taste of Yukiwari Nattô is delicious and

makes you ask for more. It has a one-month shelf life even in summer because, after removing the hard to digest outer hulls of soybeans to make it into nattô, we then add kôji and salt and ferment it for a long time. Since this natural food has no artificial coloring nor additives, it can be enjoyed by anyone from young kids to seniors—or your husband’s drinking companion.

How to eat it:

1. It is already seasoned. You can eat it over freshly cooked rice without adding any shoyu.

2. Add a little bit of graded daikon, chopped green onion (*negi*), and wasabi or *karashi* mustard (a mixture of ground mustard seeds and horseradish; hotter than European mustard) to make it even tastier. If you have a sweet palate, please be sure to mix in graded daikon.

3. Mix with egg yolk, seven-spice red pepper (*shichimi togarashi*), and/or bonito flakes to make a side dish for your drink.

4. Grind well in your *suribachi* (traditional mortar), add some water and cook it in a pot, then just before it comes to a boil, sprinkle in some fresh vegetables to make an instant natto soup (*nattô-jiru*).

5. Serve it over a rice in a bowl, sprinkle on some nori, and add boiling hot bancha tea to make delicious *ochazuke*.

6. Add a bit of sugar and butter, then and mash it. Spread it on mochi or bread. It becomes a Japanese-style cheese-like food and this unusual sandwich will be enjoyed by kids.

Yukiwari Nattô is a Natural Food. Some white spots found in the polyester bag during storing, it is not a mold. It is called tyrosine (*chiroshin*), a type of amino acid so you can eat it safely.

Note: Ohta (1975, p. 228) says that *Goto Natto*, which appeared in the early 1600s, is the ancestor of Yukiwari natto; it appeared as a special / famous product (*meibutsu*) of Yamagata prefecture, Yonezawa-Chiho.

967. Norin Suisan-sho, Nosan Engei Kyoku, Hatasaku Shinko-ka. 1983. Daizu ni kansuru shiryô [Statistics concerning soybeans]. Tokyo, Japan. 157 p. 26 cm. [Jap]

• **Summary:** This yearly report, published by Japan’s Ministry of Agriculture, Forestry, and Fisheries (MAFF), is packed with detailed statistics on soybean production, trade, and utilization in Japan. The table on p. 129 gives statistics on miso production, shipments, and use of raw materials by prefecture and for Japan as a whole. In 1981 Japan produced 575,782 tonnes of miso and shipped 578,610 tonnes. Raw materials used were 14,417 tonnes of domestically grown whole soybeans, 167,539 tonnes of imported whole soybeans, 103,611 tonnes of polished rice, 24,667 tonnes of polished barley, 476 tonnes of defatted soybean meal, 71,325 tonnes of salt, and 96 tonnes of cornmeal (used mainly in Nagano and Hyogo prefectures). The top 5 miso producing prefectures were Nagano (164,510 tonnes; 28.6% of Japan’s total), Aichi (54,529), Niigata (38,156), Aomori (28,602),



and Hokkaido (25,908). The source of these statistics is: Shokuryō-cho, Kakō Shokuhin-ka, Kome Mugi Kakō Shokuhin Seisan Dotai, Tokei Chosa.

The table on p. 130 gives similar statistics on shoyu for 1981. In 1981 Japan produced 1,190,618 kiloliters (kl) of shoyu and shipped 1,118,799 kl. Raw materials used were 6,473 tonnes of whole soybeans, 175,205 tonnes of defatted processed soybean meal (*dashi kakō daizu*), 177,407 tonnes of wheat, 204,777 tonnes of salt, and 80,642 kl amino acid liquid (*amino-san*, either purchased or made on site). The top 7 shoyu producing prefectures were Chiba (424,498 kl; 35.7% of Japan's total), Hyogo (203,374), Aichi (59,201 kl), Kagawa (45,430 kl), Fukuoka (36,575 kl), Oita (31,860 kl), Mie (30,354 kl). The source of these statistics is the same as for the miso statistics, above.

The table on p. 132-33 gives statistics on consumption of shoyu (in 100 ml), miso (100 gm), whole soybean foods (yen), tofu (cakes = *cho*), aburagé and ganmodoki (yen), natto (yen), and other soyfoods (yen) from 1963 (Showa 38) to 1981. Under shoyu, miso, and tofu is given the amount of money spent (*kingaku*), the quantity purchased (*sūryō*), and the price. Annual shoyu consumption per household has decreased from 30.5 liters in 1963 to 16.3 liters in 1981. Annual miso consumption per household has decreased from 18.4 kg in 1963 to 12.1 kg in 1981. Tofu consumption per household has remained about constant, with 87.3 cakes in 1963 and 86.9 cakes in 1981. A breakdown is also given for each food by annual household income, with 5 income levels. One grouping is for all households (including those with a retired head of household or on welfare) and the other is only households with at least one working member. In each case, the higher the household income, the greater the consumption. In the case of tofu, for example, households with an annual income of less than 2.65 million yen consumed 76.1 cakes of tofu, while households with an annual income of more than 5.8 million yen consumed 99.3 cakes. Next is a breakdown by age of head of household. Generally, the younger the head of household, the less the consumption. In the case of tofu, households whose head was 24 years or younger consumed 55.5 cakes/year, while households whose head was age 60-64 consumed 95.4 cakes. The source of these statistics is the *Kakei Chosa Nenpo (Sōri-fu, Tōkei-kyoku)*.

The table on pages 134-35 shows consumption per household by geographical area of the same foods as the previous table. Geographical areas include: all of Japan, all cities, cities with 50,000 or more population (broken down into large, medium, and small), cities with less than 50,000 population, towns and villages (*machi* and *mura*), 14 major regions, and large cities. Note: Statistics by prefecture are not given. In the case of tofu, the highest consumption is cities with less than 50,000 population (92.0 cakes), while the lowest is in medium-sized cities with more than 50,000 population (84.2 cakes). The regions with the highest tofu

consumption are Tohoku (the northeast prefectures; 101.9 cakes) and Chugoku (southwest provinces; 98.1 cakes), while the lowest two are Hokkaido (58.3 cakes) and Okinawa (72.3 cakes). The cities with the highest annual tofu consumption per household are Toyama city (118.9 cakes), Morioka city (118.4), Yamaguchi city (107.9), Matsuyama city (102.9), Fukushima city (102.8), Tokushima city (102.0), Fukui city (100.7). The source of these statistics is the same as for the statistics on p. 132-33.

Tables on pages 136-39 give a detailed nutritional analysis of soybeans and each of 23 soyfoods made in Japan. The following minerals are listed: calcium, phosphorus, iron, sodium, and potassium. Vitamins: A (retinol, carotene, international units), B-1 (thiamine), B-2 (riboflavin), niacin, and C. Soybeans grown in Japan contain, on average, 35.3% protein and 19.0% fat, compared with 33.0% protein and 21.7% fat for soybeans grown in the USA, and 32.8% protein and 19.5% fat for soybeans grown in the China. Address: Tokyo, Japan.

968. **Product Name:** [Natto].

**Foreign Name:** Nattō.

**Manufacturer's Name:** Seiyu Stooa K.K. (Marketer-Distributor). Made by Asahi Shokuhin K.K.

**Manufacturer's Address:** (1) Seiyu: 1-18-21, Minami Ikebukuro, Toshima-ku, Tokyo, Japan; (2) Asahi Shokuhin: 1911 Naga-cho, Mochida-aza (?), Oo-aza, Gyōda-shi, Saitama-ken, Japan.

**Date of Introduction:** 1983. July.

**Ingredients:** Whole soybeans.

**Wt/Vol., Packaging, Price:** 100 gm. Retails for ¥38 in Tokyo (July 1983).

**How Stored:** Refrigerated.

**New Product-Documentation:** Product with Label (see next page) purchased in July 1983 by William Shurtleff at a Seiyu department store in Tokyo, Japan. The label, printed brown and pea green on white, is 5 by 6 inches wide. At the far right are the names and addresses of the marketer and the distributor. To the left of that, in white characters on a pea-green background: Small seeded, whole soybeans. Below that is the weight (100 gm) and Seiyu's price (38 yen). The two large brown characters in the center read (from top to bottom): "Natto." To the left of that, in white characters on a pea-green background: Mustard [packet] included. Below that, in smaller brown characters: Refrigeration: Please keep it in a refrigerator and eat it as soon as possible. At the far left, in small brown characters: Contains no chemical additives, such as preservatives or artificial coloring. We try our best for good quality. If, by chance, you find any bad product, please take it to the store where you bought it so that they can give you a replacement.

969. *Zenkoku Shokuhin Shinbun (National Food News)*. 1983. Zennōren Ose kaichō kōki kōsō [Japan Natto Association's



chief for the second half of the year, Mr. Ose, and his plan]. No. 458. Aug. 11. p. 1. [Jap]

• **Summary:** Mr. Ose would like to get a patent on the tempeh process which the association has developed.

970. Torii, Yasuko. 1983. Re: New developments with tempeh and tofu in Japan. Letter to William Shurtleff at Soyfoods Center, Aug. 14. 2 p. Typed, without signature (carbon copy). [Eng]

• **Summary:** Tempeh: “(1) There was a seminar on soyfoods on Aug. 5. The topics were: ‘Tofu and Japanese foods in the U.S.’, by Prof. Okubo. ‘Does tempeh fit into the Japanese diet,’ by Prof. Katsuyoshi Tsujimura of Tokyo. A party was held after the seminar to celebrate the 15th anniversary of the Soyfoods Development Association. Many businessmen showed interest in tempeh.

“(2) Mr. Kato of the Ministry of Agriculture [*Nôrinsho*] arranged for a meeting for Nihon Kogyo KK and Kyodo Press on Aug. 9. I prepared soy and okara tempeh, and Mr. Kato brought Torigoe’s tempeh. According to Mr. Kato, articles on tempeh will be distributed to many local papers thru Kyodo Press. Nihon Kogyo seems to be interested in producing [tempeh] starter. A few researchers are going to

visit the U.S. in September to attend a convention and they hope to visit some tempeh and tempeh starter factories in California. Is it possible to make such arrangements for them?”

“(3) Mr. Sakata of Shibata Shoten [a publishing company] visited Natto Kumiai [Japan Natto Association] and attended the soyfoods seminar. A final decision concerning publication will be made in a few days.

“(4) Natto Kumiai has distributed tempeh cultures to some members to study production. A meeting is scheduled in September and I was asked to attend and talk about tempeh.”

Also discusses: Publication of The Book of Kudzu in Japanese. The Book of Tofu on NHK-TV. Address: Kamitsuchidana 324, Ayase-shi, Kanagawa-ken 252, Japan. Phone: 0467-76-0811.

971. Kanasugi, Goro. 1983. Re: Work with tempeh in Japan. Letter to William Shurtleff at Soyfoods Center, Aug. 23. 2 p. Typed, without signature. [Jap]

• **Summary:** Ose Noboru, head of the Natto Assoc. is very ill so work to introduce tempeh to Japan is not advancing well. In 1981 Teruo Ohta brought tempeh back from Indonesia and

introduced it to the Natto Assoc. in May when he lectured about it at Hanamaki hot springs (*onsen*) in Iwate prefecture. In Sept. 1981 he presented another lecture on tempeh to the Association at Yamanashi prefecture. In May 1983 at the Ueno restaurant (*Seiyoken*) in Tokyo the Natto Assoc. decided to pursue tempeh research and popularization, including recipe testing. Ohta and Kanasugi will be advisors on the project. Mr. Ebara is in charge of tempeh cultures. In June 1983 the Natto Association sent a team of 3 men to Indonesia to study tempeh. Mr. Kanasugi, Mr. Hisao Nagayama (a natto historian), and Mr. Kikuo Chiba spent 5 days in Jakarta, Bogor, and Yogyakarta, looking at tempeh production and visiting KOPTI. The trip was successful and on their return (on June 18) they presented a report. In July the Natto Assoc. founded a research laboratory in Omiya city (Saitama prefecture) and at the end of July it started to produce tempeh spores for members of the Association only, and (perhaps) to introduce tempeh as “tempeh natto” in Japanese confections and as a meat extender. The year 1983 has been proclaimed as the “first year of tempeh in Japan” (*Tenpe Gannen*). Address: Shimo-cho 3-6, Omiya-shi, Saitama-ken 330, Japan. Phone: 048-644-1323.

972. Shurtleff, William. 1983. Log of soyfoods research trip to Hong Kong, China, Singapore, and Japan: May 29 to July 10, 1983 (Unpublished report). Soyfoods Center, P.O. Box 234, Lafayette, CA 94549 USA. 117 p. Aug. Unpublished manuscript.

• **Summary:** Contents: Hong Kong: K.S. Lo and Vitasoy. May 29 (Sunday)—Plane from Hong Kong to Guangzhou City (Canton) in Guangdong (Kwantung) province. China: Guangzhou (May 29-30), Zhengzhou, Beijing, Harbin, Beijing #2 (Scurlock, Chen Xi-Hau, Joe Rakosky, Terrence Foley, local markets, vegetarian deli). Singapore: STS and Anders Lindner, Alan Yeo, American Soybean Association (Don Bushman, Sabrina Lee, Lars Wiederman).

Japan: Seiyu department store, Kibun, ASA Tokyo (Ms. Kojima), Kanji Tsuchiya, Japan Soymilk Assoc., Sano Rinji, Kikori, Prasad and natural foods, Goro Kanasugi and tempeh, Tsuchiya soymilk #1, Kikkoman at Noda (Yokotsuka #1, Mizunuma, Plant #6 modern, Yokotsuka #2, Goyo Gura, Noda Museum, Noda Library, Mr. Ichiyama), Morinaga, Kikkoman Tokyo, Japan Packaged Tofu Assoc., Natto statistics, Asahimatsu, Natto-tempeh meeting, Mr. Katoh, Nakano Masahiro, Mr. Iitsuka of Kikkoman, Daizu Shokuhin Kaihatsu, Tsuchiya #2, Nagayama, soynuts, oil association, kinako, Ishige, Mr. Mori and soy sprouts, Katoh, Arai-san, Kodansha, Nagayama and kinako, Dr. Nakano #2, Arai shoyu, Tsuchiya #3, Tenmi. Address: Lafayette, California.

973. Shurtleff, William; Aoyagi, Akiko. 1983. The book of tofu. 2nd ed. Berkeley, California: Ten Speed Press. 336 p. Illust. by Akiko Aoyagi Shurtleff. Index. Aug. 28 cm. [321

ref]

• **Summary:** Three parts of this new edition have been extensively revised and updated: (1) “Tofu Makers in the West” (p. 313-16) has been updated and now includes 310 tofu producers in the Western world (with the name, address, phone number, and contact person for each company), arranged by state or foreign country. This is the only tofu book containing such a directory.

(2) The “Bibliography” (p. 319-324) has been greatly expanded and updated. It now contains 321 publications on tofu, including all known scientific and nutritional journal articles, the 33 books about tofu written in North America since publication of the first edition of *The Book of Tofu* in 1975, and other key articles and books about tofu from East Asia and Europe, the earliest from Europe dating back to 1613!

(3) An updated listing of “People and Institutions Connected with Tofu” in the U.S. and around the world, including researchers, major tofu manufacturers in Japan, trade associations, publications, equipment dealers, and tofu apprenticeship programs.

The “Glossary” (p. 325-27) has been condensed to make space for the expanded bibliography and back matter. There is a new page about the Soyfoods Center (p. 333). The page “About the Authors” (autobiographical) has been expanded, and the photograph has been updated. “Sending Tofu to the Four Directions” (p. 335) and the inside rear cover have both been updated. Still contains 500 vegetarian recipes—both western and eastern style.

Note: A news release of 17 Aug. 1983 states: “The Book of Tofu, which introduced the Western world to tofu and inspired the founding of more than 200 tofu shops and soy dairies in North America, has sold 340,000 copies to date, making it the world’s best-seller on this popular new ‘protein source of the future.’” Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

974. Leviton, Richard. 1983. Report on soyfoods research trip across America, September 1983. Colrain, Massachusetts. 8 p. Unpublished typescript.

• **Summary:** Visited or discusses: Grainaissance (makes amazake and mochi), Brightsong (Dik / Richard Rose), Sonoma Specialty Foods (California), Northern Soy (Rochester, New York), Southwest Soyfoods (Richard Jennings), White Wave (Steve Demos, Boulder, Colorado), Quong Hop & Co. (South San Francisco, California), Modern Fare (Loveland, Ohio), Soyfoods Unlimited (Valerie, Gary and John Robertson, San Leandro, California). Soyfoods Center (Lafayette, California), Soyfoods of America (Doug Fiske and Ken Lee, Los Angeles), Real Foods (Polk St., San Francisco), Tumaros (Los Angeles), Unicorn (Terry Dalton, Florida), Japantown and Rainbow Grocery (San Francisco), Berkeley Natural Grocer and Berkeley Co-op (Bob Gerner, California), Hinode Tofu Co.,

Edensoy, Farm Foods, New England Soy Dairy, and Nasoya (Leominster, Massachusetts). Legume (Gary & Chandri Barat, New York City), Lotos / Lotus Cafe (Greg Weaver, Rochester, New York).

NRRL (Hesseltine and Wang, Peoria, Illinois): Their work is in mixed starter culture fermentation, vitamin B-12 work. Japanese man from Tokyo to work one year on natto at NRRL, paid by Japanese government. B-12 can withstand some heat during cooking and the percentage of B-12 lost depends on the initial percentage present. Natto research: examine all Japanese publications for review article. Experiment using U.S. soybeans to make natto since the Japanese buy Chinese beans for their thinner seed coat. See what happens to the oil to protein ratio during fermentation. Natto as such has no possibilities in the U.S. as it is a slimy food with a rotten smell; hard to tolerate. There might be vitamin B-12 in natto produced by *Bacillus subtilis*. Koreans have done lots of B-12 research with kimchee and other pickled vegetables. Earl Swain died this summer of a heart attack at age 36. Natto research will help U.S. soybean exports. USDA bureaucrats are making it difficult for Dr. Hesseltine to do natto research. They have 65 objectives, but Dr. Wang's projects don't fit any of them clearly, so they won't mention "food" in their research outlines, just fermentation methods. Secretary of Agriculture John Block [served 1981-86 under President Ronald Regan] says the U.S. needs more ag exports and more basic information about crops uses, so he is in support of this natto research.

Out of business: Michiana Soyfoods, St. Ignatius shop, Sunshine Soy, Heartsong, probably Joy of Soy and a Korean shop in Salt Lake City, Utah.

Concerning soymilk: 10. In Oak Park, Illinois, a natural foods retailer says Edensoy outsells San-J by two to one. (Note: San-J imports "To-Neu Natural Soy Beverage" made in Japan by Kibun). Teenagers buy the carob Edensoy along with popcorn in the store, and use it as a soft drink. But most retailers say the Eden package [stand-up foil retort pouch] is a disaster; it is impossible to open without scissors, then if you squeeze, it sometimes spills out. San-J [in a Tetra Brik carton] is convenient but the taste is poor and the front graphics are confusing—too many words and images. According to Shurtleff, both are inferior products compared to Japan's best.

22. Concerning Edensoy at the NNFA show in Denver, Colorado: Mike Potter says "it went over great." He sold two container loads right away. People liked the package and the taste. About 4,000 people sampled it and were "generally amazed." The results were as good as they could want; it generated interest and excitement. Now they are setting up the distribution system. Address: 100 Heath Rd., Colrain, Massachusetts 01340. Phone: 413-624-5591.

975. Shurtleff, William; Aoyagi, Akiko. 1983. The book of miso. 2nd ed. Berkeley, California: Ten Speed Press. 278 p.

Illust. by Akiko Aoyagi Shurtleff. Index. Sept. 28 cm. [223 ref]

• **Summary:** Contents: What is miso? Preface to the second edition. Preface to the first edition. Acknowledgments. Part I. Miso: Savory, High Protein Seasoning. 1. Soybeans, protein and world hunger. 2. Miso as a food. 3. The miracle of fermentation. 4. The varieties of miso: Regular Miso: Rice miso (red / aka, light-yellow / shinshu, mellow red / amakuchi akamiso, mellow beige / amakuchi tanshoku, mellow white / shiro koji, sweet red / edo or edo ama-miso, sweet white / Kyoto shiro miso), barley miso (karakuchi mugi, mellow barley / amakuchi mugi), soybean miso / mame miso (Hatcho miso, soybean miso / mame miso, tamari miso). Special Miso: Finger lickin' miso / Namemiso (Kinzanji miso, moromi miso, hishio, namemiso, natto miso, goto miso), sweet simmered miso / nerimiso. Modern Miso: Akadashi miso, dehydrated or freeze-dried miso, low-salt / high-protein miso.

Part II. Cooking with Miso (400 recipes). 5. Getting started. 6. Recipes from East and West. Part III. The Preparation of Miso. 7. Making miso at home and in communities. 8. Japanese farmhouse miso. 9. The traditional miso shop. 10. The modern miso factory. Appendixes: A. A history of miso and soybean chiang. B. Other East Asian misos: Chinese chiang, Korean jang and Indonesian Taucho. C. The microbiology and biochemistry of miso fermentation. D. Miso manufacturers in the West. E. People and institutions connected with miso. F. Miso with seafoods, chicken, and meat. G. Measures, weights, and equivalents. H. So you want to study miso in Japan? I. Miso additives. Bibliography [223 references]. Glossary. About the authors (autobiographical). The Soyfoods Center.

In May 1993 a new printing of this book appeared, containing many small changes made by the authors. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 415-283-2991.

976. Shurtleff, William; Aoyagi, Akiko. 1983. Appendix A: A history of miso and soybean chiang [jiang] (Document part). In: William Shurtleff and Akiko Aoyagi. 1983. The Book of Miso. 2nd ed. Berkeley, California: Ten Speed Press. 278 p. See p. 214-41. Illust. by Akiko Aoyagi. [223 ref]

• **Summary:** Contents: Introduction: Etymology. Soybean chiang in China: Early Chinese non-soybean chiang, 600-1899. Soybean chiang in Korea and Southeast Asia: Dissemination of chiang from China, Korea, Indonesia, Vietnam, other Southeast Asia.

History of miso in Japan: Introduction, early non-soybean hishios (before AD 700), the Nara period (AD 710-784), the Heian period (AD 794-1160), the Kamakura period (1185-1333). The Muromachi period (1336-1568), the Edo or Tokugawa period (1603-1867). A brief overview of origins. the Meiji and pre-war periods (1867-1939), World War II and the postwar period: Modern times (1940-1983).

History of miso in Europe: Early European references, 1900-1949, 1950-1982.

History of miso in the United States and Canada: Early developments (1896-1929), 1930-1959, growth of interest in miso (1960-1982; Shibasaki and Hesseltine at the NRRC, Peoria, Illinois, Ichiro Ouchi, the macrobiotic movement, Herman Aihara, George Ohsawa, Miso and Aveline Kushi in Boston, Massachusetts, Noboru Muramoto, George Gearhart, Thom Leonard, Allen Ginsburg and Gary Snyder, Mt. Tamalpias, Tassajara Zen Mountain Center, Miyako Oriental Foods, Kanemasa Miso Co., Ohio Miso Co., Shin-Mei-Do, American Miso Inc., South River Miso Co., Joel Dee and Miso-Cup), miso's future in the West.

Miso in other countries: Israel, India, Latin America (Brazil, Mexico), Africa.

Illustrations: Evolution of Chinese characters. Hideyoshi Toyotomi and a robber on the bridge (Hatcho miso history, p. 219). Making miso-damari (p. 220). Graph of the miso market in Japan (1880-1980) (p. 226). Ohio Miso letterhead and logo (p. 238). U.S. miso imports, production and consumption (1970-1983) (p. 240). Page 219: "The origins of modern shoyu can be traced more clearly to the mid 1200s when the Japanese priest Kakushin returned from China, having learned there the technique for preparing Kinzanji miso. Establishing himself at Kokoku-ji temple near the town of Yuasa..." Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 415-283-2991.

977. Oda, Lorraine. 1983. Tofu enjoys increasing popularity. *Hawaii Herald*. Oct. 7. p. 5. Friday.

• **Summary:** Jack Tsuneyo Uyehara manages Aloha Tofu Factory Inc. His father, Kamesaburo, brought the plant in 1951 from a pig farmer, Kamehachi Shimabukuro, who used the okara for pig feed. Back then the factory was located on Dillingham Blvd. and produced only tofu and abura-age. Today the plant on Akepo Lane in Kalihi produces each week: 3,500 pieces of soft, firm, and mini-tofu, 6,000 pieces of aburage, 2,000 packages of natto, and enough atsu-age and nama-age to supply stores in Oahu. The four Uyehara brothers run the company.

Note: This is the earliest document seen (Dec. 2001) that contains industry or market statistics for natto by individual companies. Address: Editorial Asst., Honolulu.

978. Hara, Toshio; Zhang, J-Ren; Ueda, Seinosuke. 1983. Identification of plasmids linked with polyglutamate production in *Bacillus subtilis* (natto). *J. of General and Applied Microbiology (Tokyo)* 29(5):345-54. Oct. [26 ref]

• **Summary:** "Fourteen of 18 strains of *Bacillus subtilis* (natto) were found to harbor plasmids." Twelve strains, which required biotin for growth and produced a viscous substance, contained a single plasmid species. These plasmids, which included four whose names are given, "were classified into the same type of pUH1, the functional

plasmid encoding gamma-glutamyltranspeptidase (gamma-GTP) gene," based on their molecular weights and restriction patterns.

The regulatory gene for polyglutamate synthesis is encoded on a 5.7 kb plasmid, pUH1.

Note: Plasmids of this type are known as "natto bacterium plasmids."

Whereas many strains of *Bacillus subtilis* have been found to "contain a number of endogenous plasmids, the physiological role of these plasmids has not yet been identified." Address: Dep. of Food Science & Technology, Faculty of Agriculture, Kyushu Univ., Hakozaki, Fukuoka 812, Japan.

979. Hesseltine, C.W. 1983. The future of fermented foods. *Nutrition Reviews* 41(10):293-301. Oct. [20 ref]

• **Summary:** Contents: Advantages of food fermentation, factors having an adverse effect on the use of fermented foods, nutritional and economic data on some fermented foods, future changes in fermented foods, factors that may lead to growth in the use of fermented foods (scientific interest in fermented foods, prevention of food poisoning, fermentation and increased shelf life, improvement of the physical properties of the product, interest in natural products of plant origin, modification of the substrate, interest in more healthy food, necessity of increased consumption of plant materials as population increases, cultural and religious grounds, and migration of people since World War II). Summary. Contains considerable information on fermented soyfoods. Address: NRRC, Peoria, Illinois.

980. Leviton, Richard. 1983. Soyfoods in your kitchen: The variety is infinite! *Your Good Health: Review & Digest* 1(6):16-18. Oct.

• **Summary:** An introduction to tofu and tofu products, tofu main dishes, tofu desserts, tempeh, miso, soysage, "green soybean pods in plastic bags," soynuts, natto, Hamanatto, and yuba.

Gives recipe names and ideas for each soyfood type, but no actual recipes. Concludes with the thought: "If you remember this diversity of applications of tofu and tempeh... never again will you comment, 'Tofu is nice but it's just a bland white block.'" Address: Colrain, Massachusetts 01340.

981. Nagayama, Hisao. 1983. Kenkô-shoku nattô [Natto, the health food]. Tokyo: Nosan Gyoson Bunka Kyôkai (Asakusa 7-61, Minato-ku). 209 p. Illust. 19 cm. [Jap]

• **Summary:** This popular book, filled with funny (sometimes naughty) cartoons discusses all aspects of natto, its history, nutritional value and health benefits, how to make natto at home, and even how to grow soybeans. It contains 80 natto recipes, each illustrated. The book was first printed in Oct. 1983; 6th printing Sept. 1986. Hisao Nagayama was born in 1934. Address: Toyotama-kita 4-31, Nerima-ku, Tokyo,

Japan. Phone: 03-992-3735.

982. Okada, Noriyuki; Hadioetomo, Ratna Siri; Nikkuni, S.; Katoh, K.; Ohta, T. 1983. Vitamin B-12 content of fermented foods in the tropics. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 43. p. 126-29. Oct. [7 ref. Eng]

• **Summary:** Vegetarian foods containing significant amounts of vitamin B-12 per 100 gm according to a biological assay method using *Lactobacillus leichmannii* were: tempeh (Indonesia) 4.6 mcg (micrograms), natto fermented soybeans (actually thua-nao, Thailand) 1.5 mcg, and fermented tofu (Singapore, also called Sufu) 1.1 mcg. Flesh-based foods with a high B-12 content included Ka-pi shrimp paste (Thailand) 5.3 mcg, kung-jom fermented shrimp (Thailand) 2.5 mcg, fish sauce, 3 month fermentation (Thailand) 2.4, and fish sauce (Thailand) 1.3 mcg, and fish sauce (Japan) 1.0 mcg.

Of these foods transported from tropical countries, tempeh was especially interesting because it is made of soybeans and had the highest B-12 content of any food measured. However not all tempeh samples contained such large amounts. "For example, a fresh sample of tempeh which was transported from Indonesia as rapidly as possible contained a very low amount, 0.7 mcg/100 gm, and tempehs prepared in the laboratory by using the tempeh-making fungus, *Rhizopus oligosporus*, contained only 0.02 to 0.06 mcg/100 gm. However the low vitamin B-12 content in tempeh which was transported from Indonesia increased to a value of 8 mcg/100 gm when the sample was incubated at 30°C, unlike in the tempeh prepared in the laboratory. It is probable that microorganisms accompanied with tempeh-making fungus were associated with the production of vitamin B-12 in Indonesian tempeh. Further studies will be required to identify the microorganisms capable of producing vitamin B-12, and useful for the fermentation food industry." Address: 1,3-5. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 2. Bagian Mikrobiologi, Departemen Botani, Fakultas Pertanian, Institut Pertanian Bogor, Jl. Raya Pajajaran, Bogor, Indonesia.

983. Okada, Noriyuki; Tabei, Hideo; Mori, K.; Katoh, K.; Yanagimoto, M. 1983. Baioassei-hô de kenshutsu sareru nattô no bitamin B-12 chi ni tsuite [On the vitamin B-12 values detected in natto by applying a microbiological assay method]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 43. p. 121-25. Oct. [12 ref. Jap; eng]

• **Summary:** "Natto has long been considered to contain vitamin B-12. The B-12 content of natto determined by a microbiological assay method using *Lactobacillus leichmannii* ranged from 0.01-0.08 micrograms/100 gm. These values are almost the same as those reported by other

authors. Although the commercial nattos analysed were not perfectly pure products, the possibility that the B-12-like activities detected in natto were produced by contaminants could be ruled out, since comparable values were found in purely fermented nattos made by using several strains of *Bacillus natto* isolated from commercial samples. However *B. natto* did not produce detectable amounts of B-12 in the liquid medium in which *B. megaterium*, known as a B-12 producer, did. Moreover the response of the natto extract to *L. leichmannii* was different from that of the B-12 standard and that of the 'natto' extract made by using *B. megaterium*. It is probable that the B-12-like activities detected in natto did not correspond to that of B-12." Address: National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan.

984. Taira, Harue; Takahashi, Haruo; Okano, Hirobumi; Nagashima, Shigeru. 1983. Kokusan Daizu no hinshitsu. IV. Ibaragi-ken daizu saibai hinshu no nattô kakô tekisei [Quality of soybean seeds grown in Japan. IV. Suitability of soybean varieties grown in Ibaraki prefecture for natto production]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 43. p. 62-71. Oct. [28 ref. Jap; eng]

Address: 1. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305; 2. Ibaraki Food Research Institute. Higashi Ibaraki-gun, Ibaraki-ken; 3. Ibaraki Agric. Exp. Station, Mito, Ibaraki-ken; 4. Okame Natto Honpo Ltd., Higashi Ibaraki-gun, Ibaraki-ken. All: Japan.

985. Taira, Hirokadzu; Suzuki, Norio. 1983. Nattô no shishitsu kanryô oyobi shibôsan sosei [Lipid content and fatty acid composition of natto]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 43. p. 58-61. Oct. (Chem. Abst. 101:71315. 1984). [8 ref. Jap; eng]

Address: 1. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 2. Taishi Shokuhin Kogyo Ltd., Towada, Aomori prefecture, Japan.

986. Shurtleff, William; Aoyagi, Akiko. 1983. George Ohsawa and the macrobiotic movement: Noboru Muramoto (Document part). Soyfoods Center, P.O. Box 234, Lafayette, CA 94549. 46 p. See p. 39-40. Nov. 10. 28 cm. Unpublished typescript.

• **Summary:** "In June 1971 Noboru Muramoto emigrated to America from Japan and lived with the Aiharas in San Francisco at GOMF. In Japan he had studied Chinese literature and philosophy at Tohoku University and Kanazawa University, then began his own study and practice of herbal medicine. He had begun studying Ohsawa's writings in 1942, then studied with Ohsawa after 1964, while

running a family business cleaning the cotton from futons. In 1973 he gave a series of lectures in New York which were published that year as the popular book, *Healing Ourselves* (Avon/Swan House). Many uses of miso and natural shoyu were given; soybeans and tofu were not recommended in the book, except that tofu was used in making poultice-like 'plasters' for use in healing. In 1974 Muramoto started Rising Sun, a macrobiotic storefront containing the Herb Tea Co. in San Francisco. Here he gave classes on making miso and shoyu. In November 1976 he acquired Top of the World Ranch on 140 acres of land near Glen Ellen, California, and established Asunaro Institute, a residential program of macrobiotic studies. He also published a newsletter 'Asunaro Notes.' At Asunaro he set up a regular shop for making miso and shoyu, complete with a nice koji incubation room. Many unique and American-style misos were developed, including some made with peanuts, garbanzos (chickpeas), azuki beans, and even natto. A number of Americans apprenticed at the miso-shoyu school. A nice article about the school, 'Making Miso in America,' appeared in the *East West Journal* (Lachman 1978). In March 1979 Muramoto displayed his miso and shoyu equipment and samples of his products at the famous New Earth Exposition in San Francisco. He also sold these products at Rising Sun, and some customers swore that they were the best in America."

Note: On 11 Jan. 1976 William Shurtleff attended a class on how to make miso at Rising Sun (Judah Street, San Francisco), given by Noboru Muramoto. Jimmy Udesky was there, as were about 15 other people.

On 19 Sept. 1977 William Shurtleff and Akiko Aoyagi visited Muramoto sensei at his place, Asunaro, in Glen Ellen, California. He makes miso there and teaches miso making. Shurtleff interviews him about his life and history of interest in macrobiotics and soyfoods. We stay overnight and help him the next morning with royalty problems connected with his book *Healing Ourselves*; he is quite sure he is not being paid the royalties due based on his contract with the publisher. Address: Lafayette, California. Phone: 415-283-2991.

987. Hesseltine, C.W. 1983. The safety of shoyu. Paper presented to the Japan Soysauce Brewers' Assoc. meeting. 36 p. Held 29 Nov. 1983, Tokyo. [33 ref]

• **Summary:** Historical background: In 1953, Dr. Hesseltine went from the fermentation industry to the Northern Regional Research Laboratory (Peoria, Illinois) as head of the ARS [Agricultural Research Service] Culture Collection. He had only a faint idea of how shoyu was made and he had never heard of miso, natto, or tofu. Shortly after his arrival, probably in 1953, he received a visit from Prof. Kin-ichiro Sakaguchi of the University of Tokyo, an authority on traditional Japanese fermented foods and one of the founders of the modern fermentation industry in Japan. Records show that in 1953 Dr. Sakaguchi received cultures from the ARS

collection. His laboratory trained many students and much of his work was directly related to food fermentations involving soybeans and cereals.

In 1948 Dr. A.K. Smith of the NRRL visited Japan and China and recognized the tremendous amount of soybeans being used as human food. "The Western world had little or no understanding of the importance and use of these foods in the diet of Oriental people. He strongly recommended to anyone who would listen that there should be research on these foods and an exchange of scientists." In 1949 and later in 1958 Dr. Smith published a detailed report of his travels. In late 1958 two eminent Japanese scientists, Dr. Kazuo Shibasaki and Dr. Tokuji Watanabe arrived in Peoria to study traditional soybean foods. Dr. Shibasaki (who later became Professor of Agricultural Chemistry at Tohoku University) worked with Dr. Hesseltine on miso fermentation, and Dr. Watanabe worked with Dr. Smith on tofu.

"Before the year was up I became utterly fascinated with the process of making koji and with the delicious foods that could be made from the lowly soybean. But even broader than these studies on fermented foods was the concept of the solid state fermentation and the enzymes that could be made with this technique. Ever since that year of work with Dr. Shibasaki, I have been interested in fermented foods—not just those used in Japan, but worldwide." Address: NRRC, Peoria, Illinois.

988. Kanasugi, Goro. 1983. Tempe o Nihon de tsukuru [Making tempeh in Japan]. *Shin Eiyō (New Nutrition)* No. 168. Nov. [Jap]

• **Summary:** The Natto Association had a meeting where members brought 100 tempeh dishes. A cooking teacher came and she made 5-6 tempeh dishes from tempeh made by Mr. Kanasugi; they were very popular. The members made their tempeh as follows: First the Association obtained tempeh starter from Indonesia and propagated it in a room at Mr. Kanasugi's plant. They distributed the starter to the members, who then made tempeh and used the tempeh to make dishes. Mr. Kanasugi owns a restaurant named Mame-no-ko ("child of the soybean"), where he serves tempeh in place of meat. For example, diced tempeh is served with vegetables, or made into tempura or karinto. He also makes *okoshi*, a crunchy millet (*awa*) based confection containing 20% tempeh. Ground tempeh is mixed into a ground beef cutlet. The guests like tempeh served in these ways. The Natto Assoc. is thinking of publishing a book on tempeh. A photo shows Kanasugi and various tempeh dishes. Address: Zenkoku Natto Kyodo Kumiai Rengo-kai, Fuku Kaicho.

989. Weston Graham & Associates Ltd. 1983. Eastern Ontario soybean production and marketing feasibility study. Ottawa, ONT, Canada. 26 + 138 + 114 p. Nov. 28 cm. Looseleaf.

• **Summary:** This report was prepared largely by William

W. Graham of Weston Graham & Associates for the Ontario Soya-Bean Growers' Marketing Board in cooperation with the Government of Ontario and the Government of Canada. Contents of Executive summary: Introduction. Soybean crop development needs: Producer problems and concerns, elevator operator problems and concerns, crusher problems and concerns. Conclusions and recommendations: The potential for increased soybean production, technology transfer and producer information needs, the potential for a new crushing facility in Eastern Ontario (250 tons/day at Prescott), additional handling and storage facilities for soybeans, servicing specialty food markets (natto, tofu). Summary of situation, requirements, effects and future scenarios of soybean production and Marketing in Eastern Ontario: Production, transportation/handling/storage, crushing, import and export markets.

Contents of main report: 1. Introduction. 2. Profile of production. 3. Soybean production and management. 4. Production potential. 5. Marketing and use patterns. 6. Market infrastructure options. 7. Opportunities and impacts. 8. Soybean development needs. 9. Recommendations and conclusions. List of 33 tables. List of 1 map and 2 figures.

Canadian soybean production has traditionally been restricted to the southernmost areas of Ontario. "The release of the soybean variety Maple Arrow in 1975 [developed by Dr. Donovan and Dr. H. Voldeng using Fiskeby V and Harosoy crosses] made commercial scale soybean production a reality in Eastern Ontario." Maple Presto, an extremely early maturing variety, was licensed and released in 1978, but it did not gain wide acceptance due to its relatively low yields. In 1981 Maple Amber was released and has since become popular in shorter-season zones; its yields are generally only a little less than Maple Arrow. Maple Arrow is currently the variety most widely grown in Eastern Ontario. "Soybeans have been grown in Eastern Ontario since the mid-1930s, but until recently were only produced on a very limited scale. During the 1940s and 1950s Dr. Dimmock carried out a research program at the Central Experimental Farm in Ottawa. Varieties such as Comet, Crest, and Acme were adapted to the short season..." In 1976 only 462 acres of soybeans were grown in Eastern Ontario and most of these (197 acres) were grown in Glengarry County. But in 1981 some 11,089 acres of soybeans were grown in Eastern Ontario; the 3 top counties were Prince Edward (4,263 acres), Dundas (1,474 acres), and Ottawa/Carleton (1,129 acres). Since the 1981 census of agriculture, soybean acreage has more than doubled, to an estimated 23,000 acres in June 1982.

In Quebec province, only 66 acres of soybeans were grown in 1961, rising to 1,234 acres in 1971 and 3,555 acres in 1981. The main soybean growing counties in southern Quebec in 1981 were Richelieu (1,840 acres) and SW Montreal (1,333 acres). Address: 1684 Woodward Dr., Suite 217, Ottawa, ONT, K2C 3R8 Canada. Phone: (613) 225-

0226.

990. *Nihon Shokuryo Shinbun (Japan Food News)*. 1983. Nebaranai nattô. Marukin Shokuhin Sangyo SunSeed. Shôhin-ka ni seikô [The natto that isn't sticky—SunSeed Tempeh from Marukin Foods. They succeeded in commercializing it]. Dec. 1. [Jap]

• **Summary:** A photo shows a packet of Marukin SunSeed Tempeh.

991. Breuls, René F. 1983. Re: Tempeh production by a natto manufacturer in Japan. Letter to Cynthia Bates at Farm Foods, Summertown, Tennessee, Dec. 19. 1 p. Typed, with signature on letterhead.

• **Summary:** "The natto producer which we have been supporting and provided with samples so far has produced the best Tempeh in Japan. They have interested the Natto Association to backup their efforts. Dr. Ohta, the advisor to the Natto Association, is receiving small [tempeh] samples from the U.S.A. which he gives to our people to continue their experiments. We do not know from where in the U.S.A. he receives them.

"Our natto producer is now getting a number of natto producers together to start a joint venture tempeh factory. Because of contamination hazards the producers cannot use their own natto factories although the equipment is not so much different.

"In Southern Japan some marketing trials are made to see consumer reactions to this new soy product. It is expected that next year the Tempeh will be launched in Japan with all the necessary advertising and promotion.

"We will supply the spore powder when it will be required in commercial quantities. Please find enclosed our cheque for US\$70. Please send us 100 gram spore powder so our people can familiarize themselves with it." Address: Asiatic Company Ltd., C.P.O. Box 1942, Tokyo 100-91, Japan. Phone: (03) 273-0773.

992. Kamata, Yoshiro; Kato, Takehiro; Yamauchi, Fumio. 1983. [Denaturation of protein in steamed soybeans]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society for Food Science and Technology)* 30(12):704-08. [Jap; eng]\*

993. Rhee, Sook-Hee; Kim, S.K.; Cheigh, H.S. 1983. [Studies on the lipids in Korean soybean fermented foods. I. Changes in lipids composition during Chungkookjang fermentation]. *Hanguk Sikp'um Kwahakhoe Chi (Korean J. of Food Science and Technology)* 15(4):399-403. Dec. [23 ref. Kor; eng]

• **Summary:** "Chungkookjang, a traditional Korean fermented soybean food, was prepared by a commercial process. Cooked soybeans were fermented with *Bacillus natto* for 3 days and ripened with addition of 7% salt for 20 days."



Note: This is the earliest English-language document seen (Jan. 2012) that uses the word “Chungkookjang” to refer to Korean-style natto. Address: 1. Dep. of Food and Nutrition, Busan National Univ., Busan; 2-3. Food Chem. & Technol. Lab., Korea Advanced Inst. of Science & Technol., Seoul, South Korea.

994. Suh, Jeong-Sook; Ryu, M.K.; Hur, Y.H. 1983. [Effect of bacillus strains on Chungkook-jang processing. III. Changes of free amino acid contents and nitrogen compounds during Chungkook-jang koji preparation]. *Hanguk Sikp'um Kwahakhoe Chi (Korean J. of Food Science and Technology)* 15(4):385-91. Dec. [31 ref. Kor; eng]

Address: 1. Dep. of Food Science & Nutrition, Seoul College of Health; 2. Lab. of Sampyo Food Indust. Co., Ltd., Seoul; 2. Dep. of Food Processing Technology, Seoul College of Health.

995. **Product Name:** [Miso, Shoyu, Koji, and Natto].

**Foreign Name:** Miso, Shoyu, Koji, Nattô.

**Manufacturer's Name:** Ab & Paulien Schraft Soyfoods.

**Manufacturer's Address:** Mas Miquelet, Baillestavy 66320, France.

**Date of Introduction:** 1983.

**New Product–Documentation:** Letter from Sjon Welters. 1982. April 16. “Two Dutch people, just back from studying with Thom Leonard and The Farm (Tennessee) in the States, are setting up a small plant to produce miso, shoyu, natto, and koji: Ab & Paulien Schraft.”

Shurtleff & Aoyagi. 1983. *The Book of Miso*. 2nd ed. p. 255. Letter from Sjon Welters. 1989. July 24. “As far as I know, this company never got off the ground.”

996. **Product Name:** Hime Brand Mito Natto. Fermented Soy Beans.

**Manufacturer's Name:** JFC International Inc. (Importer, Distributor). Made in Japan.

**Manufacturer's Address:** South San Francisco, CA 94080.

**Date of Introduction:** 1983.

**Ingredients:** 1986: Soy beans, water, mustard in separate packet.

**Wt/Vol., Packaging, Price:** 3.5 oz. (100 gm). Retail for \$0.69 (1986, Walnut Creek, California).

**How Stored:** 1986: Frozen.

**New Product–Documentation:** Label. 1983, undated. Red and blue on clear film.

Product with Label purchased at Diablo Oriental Foods. 1986. Product name is now: Mito Natto: Fermented Soy Beans W / Mustard. Red, black, white and gold on clear film. 5 by 5 inches. Circular illustration of a Japanese princess (*hime*) in upper right of front panel. “Keep frozen.” On one side: “Sandwich natto: You can make sandwich natto by placing Natto between the breads.” “Keep frozen. Thaw before using. If thawed accidentally, use as soon as possible.



Do not refreeze.” Other side: “How to use natto in cooking.” Recipes for: (1) To serve it with noodles. (2) Natto paste.

997. Komatsuzaki, T.; Ohkuro, I.; Kuriyama, S.; Kawashima, M. 1983. [Influence of carrageenan on the non-specifically immunizing effects of natto bacilli]. *Igaku to Seibutsugaku (Medicine and Biology)* 106:163-67. [Jap]\*

998. **Product Name:** [Tempeh Natto (actually this is tempeh)].

**Foreign Name:** Tenpe Nattô.

**Manufacturer's Name:** Takashin Shokuhin (Takashin Foods).

**Manufacturer's Address:** Tachibana 1-29-2, Sumida-ku, Tokyo 131, Japan. Phone: 613-5311.

**Date of Introduction:** 1983.

**How Stored:** Refrigerated.

**New Product–Documentation:** Letter, Label and leaflet sent by Mr. Mitsuaki Yamanaka of Takashin. 1984. May. Shurtleff & Aoyagi. 1985. History of Tempeh. p. 75.

999. Fujimori, Ikuo. 1983. Daizu. Shizen kindaabukku [Soybeans. Natural children's book]. Tokyo: Fureberu-kan K.K. 30 p. Illust. by Akira SETO. 26 cm. [Jap]

• **Summary:** A children's book with superb color

**HOW TO USE NATTO IN COOKING**

**1) TO SERVE IT WITH NOODLES:**

Please prepare Natto by pouring soy sauce into mixed sliced onion, kneaded mustard, grated radish and dried seaweeds in the amounts you desire.

**\* Natto Udon, Natto Soba:**

Please sprinkle Natto over hot Udon or Soba and serve it while hot.

**2) NATTO PASTE:**

Please grind down Natto and season it with salt and monosodium glutamate, and if yolk is added the taste will further improve. Use it as follows:

**\* Sandwich Natto:**

You can make sweet sandwich by placing Natto between the breads.



KEEP FROZEN, THAW BEFORE USING  
IF THAWED ACCIDENTALLY, USE AS SOON  
AS POSSIBLE. DO NOT REFREEZE.



illustrations. Shows how to make natto, tofu, and soy sprouts at home. A large color photo (p. 10-11; 2-page spread), titled "All made from soybeans," shows kinako, miso, shoyu, soymilk, yuba in a bowl of clear soup, ganmodoki, aburage, cooked whole soybeans (*nimamé*), okara sauteed with vegetables, dengaku (made with tofu and miso), and atsu-agé. Address: Daizu kairyo no dai-ichi ninsha [President, Takeya Miso Co., Nagano, Japan].

1000. Herrmann, Karl. 1983. Exotische Lebensmittel. Inhaltsstoffe und Verwendung [Exotic foods. Ingredients and uses]. Berlin, Heidelberg, & New York: Springer-Verlag. x + 175 p. Illust. 21 cm. See p. 111-19. Sojabohnenprodukte. [18 ref. Ger]

• **Summary:** The chapter on legumes contains brief introductions to soybeans, green vegetable soybeans (*unreife Sojabohnen*), soy sprouts (*Sojabohnensprossen*, *Sojabohnenkeimlinge*), soymilk (*Sojamilch*), tofu (*Tofu*, *Sojaquark*), soy sauce (*Sojasosse*, *Shoyu*), miso (*Miso*, *Sojapaste*), tempeh (*Tempeh*), fermented tofu (*Sufu*, *chinesischer Sojabohnen-Käse*), and natto (*Natto*, *fermentierte ganze Sojabohnen*). Tables shows the nutritional composition of tofu, deep-fried tofu pouches (*Aburage*), dried-frozen tofu (*Kori-Tofu*), yuba (*Yuba*), roasted soy flour (*Kinako*), and miso, plus defatted soybean meal (*entfettetes Sojabohnenmehl*; 51% protein), and soybean concentrate (*Sojabohnen Konzentrat*; 64.9% protein). Address: West Germany.

1001. Hesseltine, C.W. 1983. Microbiology of Oriental fermented foods. *Annual Review of Microbiology* 37:575-601. [50 ref]

• **Summary:** Contents: Introduction. Historical account. Importance of mixed cultures. Microorganisms used.

"The Japanese Food Agency, Ministry of Agriculture, Forestry, and Fisheries (1979), gave the following figures for 1979: miso, 567,776 tons; shoyu, 1,252,431 kiloliters; and natto, 158,000 tons. In Korea, 35% of the 442,803 metric tons of soybeans produced is fermented. Indonesia uses about 75,600 tons of soybeans in making tempeh.

"There is considerable ancient writing in Chinese publications about foods made by fermentation, but the first scientific reports are only about 100 years old. From 1878 until the beginning of World War I, there was an explosion of papers and reports dealing with fermented foods and drinks... In general, studies between 1881 and 1914 were devoted to the description of the product and the local name and to the isolation and description of the microorganisms associated with the fermentation. A number of organisms new to science were described and illustrated. Additional information was given on the action of the fungus on the substrate, suggested uses of the fungus in processes that could be exploited in European technology, and a description of the substrate preparation, food use, and native methods of

food preparation.

"This period of research ended abruptly with the advent of World War I, as the exchange of students and cooperation between Japan and Germany ceased. Food fermentation studies resumed in the 1950s and today considerable interest exists. This renewed interest stems from the concern with nutrition, the great enthusiasm for vegetarian and natural foods, the search for less expensive, high-protein foods, the influence of foreign students studying in the West, the need to expand export markets, the need to add products to convenience foods to add zest and flavor, and the interest in the activities of microorganisms used in fermented foods." Address: NRRC, Peoria, Illinois.

1002. Joshi Eiyō Daigaku. 1983. Tōfu kukkingu [Tofu cooking]. Tokyo: JED Shuppan-bu. Kyo no Okazu No. 9. 128 p. Illust. Index. 19 cm. [Jap]

• **Summary:** Contents: From tofu in Japanese to tofu in English: Modern thoughts on tofu. Ikuko Hisamatsu's healthy tofu menu: Homemade tofu, western style tofu recipes, second generation tofu products and recipes, okara, natto, soymilk. Fujiko Sakami's Japanese style recipes: Homemade second generation tofu products taste better, Japanese style tofu recipes, okara. Seiko Osato's Chinese-style recipes: Introducing the taste of the homeland of tofu in China, Chinese second generation tofu products. Other comments: The history of tofu, the roots of tofu, the challenge of homemade tofu, tricks of Western style tofu recipes, European and American tofu cooking. Note: A color photo accompanies each recipe. Address: Tokyo, Japan.

1003. Kushi, Michio; Jack, Alex. 1983. The cancer prevention diet: Michio Kushi's nutritional blueprint for the relief and prevention of disease. New York, NY: St. Martin's Press. xi + 460 p. Index. 22 cm. [32 ref]

• **Summary:** In this book, cancer preventing effects are attributed to miso (p. 50-51, 220-21, 304-06), and to soybeans (p. 51, 154-55, 293, 306). Natto, soymilk, tamari, tempeh, and tofu are also discussed.

Pages 50-51 note: "A ten-year study completed in 1981 by the National Cancer Center of Japan reported that people who ate miso soup daily were 33 percent less likely to contract stomach cancer than those who never ate miso soup. The study also found that miso was effective in preventing heart and liver diseases..."

"Soybeans, a major source of protein in the macrobiotic diet, have been singled out as especially effective in reducing tumors. The active ingredient in soybeans is called a protease inhibitor. Laboratory tests show that soybeans and certain other beans and seeds containing this factor added to the diet prevent the development of breast, stomach, and skin tumors. Whole soybeans and soy products, including miso, tamari soy sauce, tofu, tempeh, and natto are staples of the macrobiotic diet... At St. Luke's Hospital in Nagasaki, a

group of macrobiotic doctors and patients who had survived the atomic bombing on August 9, 1945 subsequently protected themselves against potentially lethal doses of radiation on a diet of brown rice, miso soup, sea vegetables, and sea salt.”

Pages 220-21 contain a long excerpt from the account of Dr. Tatsuchiro Akizuki, director of internal medicine at St. Francis's Hospital in Nagasaki. He survived the world's first atomic bomb attack on 9 Aug. 1945. He believed that the main reason that neither he nor any of his co-workers at the hospital suffered or died from radiation was because of their diet, based on miso, brown rice, and sea vegetables.

Pages 293, and 304-06 summarize a number of publications which seem to show that consumption of soybeans, miso, or soymilk may prevent cancer. Pages 391-99 contain soyfoods recipes. Address: Boston, Massachusetts.

1004. Steinkraus, Keith H. 1983. Fermented foods, feeds and beverages. *Biotechnology Advances* 1(1):31-46. [70\* ref]  
 • **Summary:** Contents: Abstract. Indigenous fermented foods / beverages: Indian idli, dawadawa (daddawa), soy sauce (Thailand), Indonesian tape, fish sauces, Japanese koji, Nigerian millet beer (oyokpo), Kenyan uji. Microbial / single cell protein (SCP): Mushrooms.

Note: Dawadawa made from soybeans is not mentioned. Address: New York State Agric. Exp. Station, Geneva, NY 14456.

1005. Swaminathan, Mahadeva. 1983. Oilseed and nut proteins. In: Miloslav Rechcigl, ed. 1983. *CRC Handbook of Nutritional Supplements*. Vol. I. Human Use. Boca Raton, FL: CRC Press. 564 p. See p. 3-27. [147\* ref]

• **Summary:** Contents: Introduction. Production: Soybeans, cottonseed, sesame seed, copra, sunflower seed. The chemical composition and nutritive value of the proteins of certain oilseeds and nuts: Chemical composition, essential amino acid composition and nutritive value of proteins, amino acid supplementation of the proteins of oilseeds and nuts. Deleterious constituents present in oilseeds and legumes. Effect of processing on the nutritive value. Processed foods based on oilseeds and their meals: Preparation of edible meals, protein isolates from oilseeds and nuts. Infant foods and milk substitutes from oilseeds and nuts: Infant foods and milk substitutes from soybeans (soy milk, dried soybean milk, large-scale production), nutritive value of soybean milk and soybean milk proteins (animal experiments, treatment of protein malnutrition in children), feeding experiments with infants and children, milk substitutes and infant foods from peanuts, nutritive value of peanut milk and its proteins, feeding trials with infants and children, coconut milk and products based on coconut milk. Milk substitutes based on other nuts and oilseeds: Almond milk, cashewnut milk. Protein foods based on oilseed meals

and isolates: Supplements based on soybean meal, on peanut meal, on cottonseed flour, on sesame flour, on coconut meal, on sunflower seed meal. Other processed products based on oilseeds and nuts and their meals: Products based on peanut and peanut flour, enriched tapioca flour and macaroni products, products based on soybean and soybean meal (baked products, macaroni products, tofu, natto, tempeh), foods based on protein isolates from peanut and soybean, products based on peanut protein isolate, products based on soy protein isolate (infant foods, textured food products). Conclusion.

Table 13 (p. 18) lists “Supplementary foods for weaned infants and preschool children.” The following contain soya (usually defatted soy flour): Protein Food I and II (India). Fortifex (Brazil). Cerealina (Brazil; with full-fat soy flour). Multipurpose Food, CSM, WSB (USA). Pronutro (South Africa).

Note: On pages 156-57 is a brief description of quark, a non-fermented edible milk protein product widely used in Germany. It is a fresh, uncured cheese, usually sold in bulk form. Versatile and easy to use, it is made by coagulating the milk exactly like cottage cheese, “but instead of cutting, cooking, and washing the curd particles, the whole coagulum is passed through a specially designed centrifuge” to separate the whey from the solidified protein curd, which is then cooled and packaged in bulk. When made under sanitary conditions, the quark has a good shelf life under refrigeration. Some 30-40 different food products based on quark (such as spreads, dips, and desserts) are now sold in western and eastern Europe. A survey concluded that quark has considerable potential in the USA if (like yogurt, the most newly accepted dairy food in the USA) it is well advertised and promoted. Address: Retired, Applied Nutrition and Dietetics Discipline, and Emeritus Scientist, CFTRI, Mysore, India.

1006. Tims, William; Allanson, Robert. 1983. Macrobiotic dietary suggestions. Mountain Ark Publishing Co., 109 S. East Street, Fayetteville, AR 72701. 38 p. 22 cm.

• **Summary:** Under “Bean Products,” tofu, tempeh, and natto are mentioned. “Fermented foods make wonderful seasonings for soups and strengthen the digestive function. Those used in making soups include: Miso, shoyu, tempeh, sauerkraut.” There are recipes for Boston baked soybeans, and Boiled tofu. Address: Fayetteville, Arkansas.

1007. Wang, H.L. 1983. Oriental soybean foods. In: Ivan A. Wolff, ed. 1983. *CRC Handbook of Processing and Utilization in Agriculture*. Vol. II: Part 2. Plant Products. Boca Raton, FL: CRC Press, Inc. See p. 91-106. Illust. Index. 26 cm. CRC Series in Agriculture. [10 ref]

• **Summary:** Contents: Introduction. Traditional nonfermented soybean foods. Fermented soybean foods. Tables: (1) Oriental nonfermented soybean foods: Fresh

green soybeans, soybean sprouts, soybean milk, protein-lipid film [yuba], soybean curd [tofu], soybean flour (local names: Tou-fen, kinako). (2A) Composition of some indigenous soybean foods, 100 g, edible portion. (2B) Composition of some indigenous soybean foods, 100 g, edible portion. (3) Essential amino acid content of some indigenous soybean foods. (4) Oriental fermented soybean foods. (5) Characteristics of rice miso in relation to fermentation condition. (6) Average composition of soy sauce made from whole soybeans and defatted soybean meal. (7) Composition of various types of miso.

Figures: (1) Flow sheet for the preparation of soybean milk and its related products. (2) Flow sheet for manufacture of soy sauce. (3) Flow sheet for manufacture of miso. (4) Flow sheet for making hamanatto. (5) Flow sheet for preparation of sufu. (6) Flow sheet for tempeh fermentation. (7) Flow sheet for preparation of natto.

Note: Vol. 1 is "Animal products." Vol. 2 is "Plant products," Part A. Vol. 3 is "Plant products," Part B. Address: NRRC, Peoria, Illinois.

1008. **Product Name:** [Korumame (Dried Salted Natto)].  
**Manufacturer's Name:** Marumiya K.K.  
**Manufacturer's Address:** Obayashi 287, Otsu-cho, Kikuchi-gun, Kumamoto-ken, Japan.  
**Date of Introduction:** 1983?

1009. Takahashi Yuzo Kenkyusho. 1983? Nattô seizô-hô [Method for making natto at home (Leaflet)]. Yamagata-shi, Japan. 1 p. Undated. [Jap; eng+]

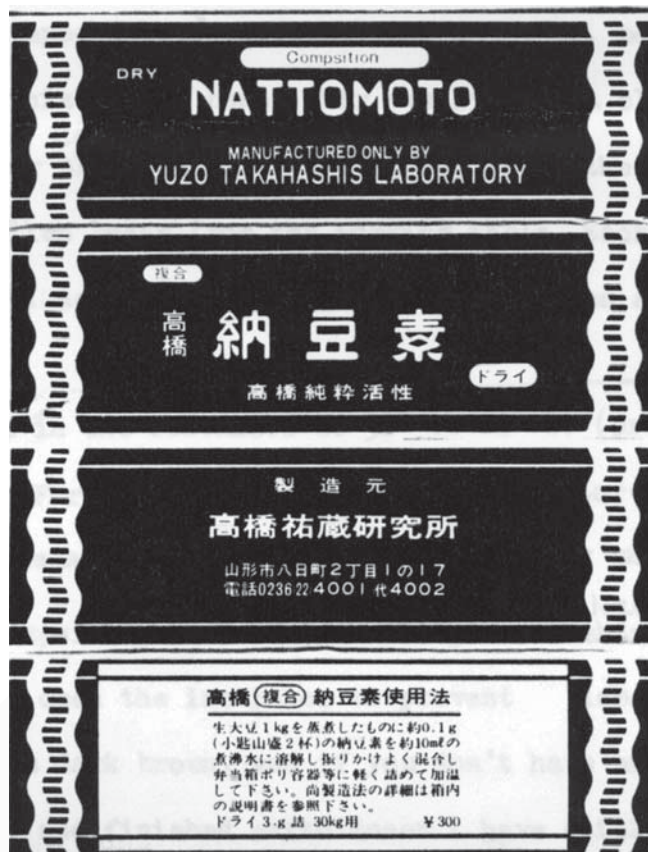
• **Summary:** This company makes *Nattomoto*, a dry, commercial natto starter. A copy of the label accompanies the pamphlet. The pamphlet explains: 1. Choose 1 kg well dried, new crop soybeans. Remove any bug-eaten or immature beans, as well as sand, stones, dust, etc.

2. Wash well and soak in 2½ their volume of water overnight to allow them to expand well. The average soaking time is 12 hours in summer, 24 hours in winter.

3. Drain off the water and discard. Steam-cook the soybeans for 8-9 hours in a cooking pot or 5-6 hours in a square *seiro* steamer [see *The Book of Miso*, p. 176]. The cooked beans should be yellowish dark brown in color and you should be able to crush them easily between your thumb and finger tip.

4. Drain the cooked beans in a clean colander. When they are still hot, dissolve 0.1 gm (2 heaping spoonfuls) of Takahashi natto starter in 10 ml boiled and cold water; sprinkle this on the beans. Mix evenly with a clean spatula. Quickly pack the inoculated soybeans into a heat resistant container (metal, glass, or Tupperware plastic) and cover it. Do not touch the beans with your fingers or pick up any beans that may have fallen from the work table.

5. Incubate the beans in the container at 38°C to 42°C (ideally 40°C or 104°F) for 20-24 hours. For your incubator,



a chicken incubator is ideal, but you can use a heater or boiler room, a homemade incubator (box with a heat source underneath), etc. But the temperature should never exceed 42°C. During incubation, do not open the incubator to prevent loss of moisture. If you overheat, the natto becomes dark brown, and if there is not enough moisture it becomes too dry and crumbly, has a bad taste, and the sticky natto strings do not develop properly.

6. After incubation, remove container from incubator and leave to cool.

There is also a short "Easy lunch box natto making method." A Japanese lunch box is metal. Using this method, if you cook the soybeans well, you don't have to worry about the moisture. Address: 2-1-17 Yoka-machi, Yamagata-shi 990-91, Japan.

1010. *Toyo Shinpo (Soyfoods News)*, 1984. Wadai no "tenpe." Seihin shôkai. Sono hinshitsu to saikin no ugoki. Shokuhin gakusha mo hyôka [People are talking about tempeh. Product introduction. Its quality and latest trends. Food researchers also value it]. Jan. 1. p. 29. [Jap]

• **Summary:** At the end of 1983 Torigoe Seifun started test marketing tempeh at a major department store in Kyushu. Taste testing done among college girls in Japan shows that they prefer tempeh (76.4%) to natto. Torigoe Seifun says that after marketing tempeh to industrial users (institutions and food processors) at 1,500 yen/kg, they have received many

enquiries. They haven't decided the price for home use yet. Their goals: (1) Tempeh production of 15,000 kg/month; (2) Sales of 100 million yen from July–Dec. 1983; (3) In three years their sales goal is 2,000 million yen.

1011. Hesseltine, C.W. 1984. Re: Three current projects at the Fermentation Laboratory. Letter to William Shurtleff at Soyfoods Center, Feb. 17. 1 p. Typed, with signature on letterhead.

• **Summary:** They are: (1) A review of what is known about natto. (2) Project on mixed culture fermentations and the starter culture business in China and Indonesia. “We have discovered that all the starter mold cultures in ragi, etc. are capable of anaerobic growth which is not the situation in nearly all other fungi.” (3) Dr. Hesseltine is preparing an hour lecture on the history of research on fermented foods in the USDA, and particularly at the Peoria laboratory. “I have been honored by being selected to give the Annual Lecture of the Mycological Society of America at their annual meeting next August at Colorado State University.

“Professor Doyle at the Food Research Institute informs me that he is now preparing a paper on his studies on the tofu safety situation.” Address: Chief, Fermentation Lab., USDA/NRRL, Peoria, Illinois.

1012. Hesseltine, C.W. 1984. Re: Research on natto. Interest in letters of Frank N. Meyer concerning fermented foods and soybeans. Letter to William Shurtleff at Soyfoods Center, March 22. 1 p. Typed, with signature on letterhead.

• **Summary:** “It will be some time before we get a review of natto published since our emphasis just now is to do as much laboratory work as possible. Our interest currently is a study of the genetic stability of *Bacillus natto* which, under many conditions, runs down rapidly. Secondly, we are looking at whether *B. natto* is a separate species from *B. subtilis*.

“Your comments on the letters of the USDA Plant Explorer, Frank N. Meyer, are especially interesting. Where can I see the letters that deal with fermented foods or even soybeans? Next summer I am preparing a lecture on the involvement of USDA in soybean fermented products. I knew there was a man by the name of Meyer associated with soybean exploration, but I was not aware of his description of any soybean foods. I would like to mention these letters since the first scientific paper from USDA was a paper by Church on angkak [red fermented rice] in 1920.

“Thank you also for the information on soy milk and your proposed terminology and standard for tofu. This should be circulated to people in the industry to get their reaction and suggestions as to whether they can live with the standards.” Address: Chief, Fermentation Lab., USDA/NRRL, Peoria, Illinois.

1013. Vansickle, Janice. 1984. Bean worth weight in gold. *Windsor Star (Essex County, Ontario, Canada)*. March 26. p.

B1-B2.

• **Summary:** Soybeans are now Essex County's major field crop and the third largest cash crop in Ontario province (with a value of more than \$203 million in 1982), but few people know what happens to the golden nuggets after they leave the farm. Most of the soybeans are crushed in Canada to make soybean oil and meal. Last week the Ontario Soya-Bean Growers' Marketing Board held a symposium in Toronto titled “Ontario soybeans—A journey into the next century.” Sheldon Hauck, vice-president of the Soy Protein Council in the USA and one of the speakers estimated that soy protein is an ingredient in over 2,500 readily available grocery store items. Contains a nice history of the soybean in Canada. Ontario now exports soybeans to 20 countries, “including major shipments to Japan, which buys only top quality soybeans and turns them into soyamilk, soyaflour, tofu, miso—a soyapaste for soup—and natto—a fermented soybean used as an appetizer.” Speaker after speaker confirmed a bright future for soybean exports. Moreover, all supermarkets in Windsor now carry tofu, a soya curd. Soy oil is found in margarine and cooking oils. Soy protein appears in soya sauce, simulated bacon bits, and infant formulas. The H.J. Heinz Company in Leamington has been working with the marketing board to develop a line of processed soybean products for the retail market.

Ontario's three soybean crushing plants are experiencing hard times, in part due to competition from canola oil (which enjoys subsidized freight rates); they are operating at 62% of capacity and could be forced to shut down. Photos show: A pair of cupped hands holding soybeans. Peter Epp, chairman of the Ontario Soybean Growers Marketing Board.

Note: This is the earliest English-language document seen (March 2009) that uses the term “soyapaste” to refer to miso. Address: Star agriculture reporter.

1014. Epp, Peter H. 1984. The Ontario Soya-Bean Growers' Marketing Board's view of the next century. In: Ontario Soya-Bean Growers' Marketing Board. ed. 1984. Ontario Soybean Symposium. Chatham, Ontario, Canada: OSGMB. 319 p. See p. 302-311.

• **Summary:** Discusses: Soybean pricing and the open tariff-free border with the USA. The Oleomargarine Act. Minimum Compensatory Rates (MCR's) and why they have put the Ontario soybean crushing industry in jeopardy (The program, established by the Canadian Transport Commission, originally encouraged the movement of raw rapeseed from Western to Eastern Canada. The government has poured \$3 million annually into the program, which ends up subsidizing rapeseed oil in Ontario), the present status and potential of soybean crushing in Ontario (in 1982-83 three Ontario crushers crushed 1 million tonnes of soybeans). Market development.

Tables and graphs show the following, related to Canadian edible oil production, from 1973-1983: Margarine

oil, shortening oil, cooking and salad oil, soymeal and rapemeal, soyoil and rapeoil. Note that for cooking and salad oil, rapeoil has always and increasingly exceeded soy oil production during this period. Total rapeoil production passed soyoil production in about 1975 and is now more than double that of soyoil. Soymeal production has always exceeded rapemeal production.

Note: This is the earliest English-language document seen (Oct. 2007) that contains the word "rapeoil." Address: Chairman, OSGMB, Leamington, ONT, Canada.

1015. Gotoh, K. 1984. Historical review of soybean cultivation in Japan: Scientific approaches (1946-1977) (Document part). *Tropical Agriculture Research Series* No. 17. p. 138-40. March.

• **Summary:** "1. Characteristics of this period: Extensive research work on soybean breeding and cultivation started after World War II. Nagata (1955) wrote a book on soybeans in a comprehensive manner, based on domestic and foreign information. It may be said that Nagata's publication was the first well written Japanese book on soybeans.

"The progress of research works was compiled by Saito (1972; breeding), by Kaizuma and Fukui (1972; quality breeding), by Konno (1972; physiology) and by Matsumoto and Ohba (1972; production techniques) in the Proceedings of the Symposium on Food Legumes held at the Tropical Agriculture Research Center in 1972.

"In the early stage of this period, production of soybeans for oil was attempted. However, since the quantity of soybeans imported from the USA increased, especially after 1961 when the Japanese market was opened for soybean importation, production became restricted to protein use or food.

"During this period the constraints on soybean production were analysed in each area in Japan...

"Thus breeding for overcoming these hazards was undertaken and cultivars showing cool weather tolerance, cyst nematode resistance, virus disease resistance, resistance to several important diseases, and lodging resistance were released in each location.

"One of the important objectives of breeding was to obtain cultivars with white hilum of grains which was requested from the processing industry, especially for miso production. Thus, 30 of a total of 43 cultivars released from 1961 to 1977 had white hilum. As mentioned previously, large seed size was preferred for consumption, and the cultivars with large seed size became predominant. However, several cultivars with small seeds were maintained for natto production.

"2. Genetic resources: During the period 1952-1954 surveys on land races of soybeans were conducted and the data were summarized in 1957. According to the results, Tohoku had abundant genetic resources. Almost all of the land races were grown in dikes surrounding paddy fields and

some were used for soiling under alluvial and diluvial soil conditions and for the cultivation of vegetable beans.

"It was well known that the wild soybean (*Glycine soja* Sieb. et Zucc.) is native to Japan, except for Hokkaido. However, in 1973 this variety was observed along the river Saru in the Hidaka area of Hokkaido and thereafter along several rivers there...

"3. Cultivation practices recommended: Several research workers attempted to introduce modern technology for the management of soybeans...

"4. Physiological studies: Fukui and Arai (1951) classified cultivars, based on the length of growth from germination to flowering and flowering to maturity. This classification which does not correspond with the maturity groups of the USA is widely used in Japan. Groups Ia, Ib, and IIa belong to the so-called summer type, IIb, IIc, IIIb, and IIIc to the intermediate type, and IVc and Vc to the autumn type, respectively...

"5. Plant density: Although progress has been made in the understanding of soybean characteristics as a crop, the cultivation of soybean in practice is still based on sparse planting on an individual plant basis. This concept may be due to the fact that under the hot and humid conditions prevailing in Japan luxuriant growth and severe lodging are likely to be associated. Thus plant growth must be inhibited and the number of branches must be increased for increasing the number of nodes in turn results in the increase in the number of pods. Consequently, cultivars bred before 1960 were generally adapted to such growing conditions. However, several cultivars bred after 1961 had a stiff stem and seemed to be adapted to dense planting. These findings suggest that the plant type has been changing from the branching type to the main stem type in which a larger proportion of pods occurs on the main stem, and lodging resistance becomes far more important.

"6. Differences between record yields and average yields: During this period record yields were obtained in several Agricultural Experiment Stations and in some yield contests as outlined in the paper of Gotoh (1982). However, the average yield of soybeans was low as usual, namely, less than 1.5 tons." Address: Faculty of Agriculture, Hokkaido Univ., Nishi 9, Kita-ku, Sapporo, Japan.

1016. Konno, S. 1984. Soybean production in Japan. *Tropical Agriculture Research Series* No. 17. p. 95-102. March. International Symposium on Soybean in the Tropics and Subtropics.

• **Summary:** Abstract. Trend in soybean production. Trends in supply and consumption of soybeans. Methods of cultivation currently applied in Japan. Soybean research and extension. Government participation in and support of soybean production. Future prospects of soybean production and main constraints. Discussion. Tables: (1) Production and trade of soybeans in Japan. (2) Soybean consumption

in Japan. (3) Varieties registered during the last decade. Figures: (1) Soybean production by region in Japan (1983). (2) Planting and harvesting time of soybean in Japan. (3) Centers for breeding and research on soybean affiliated to the Ministry of Agriculture, Forestry and Fisheries in Japan. Address: Tropical Agriculture Research Center, Yatabe, Tsukuba, Ibaraki 305, Japan.

1017. Saio, Kyoko. 1984. Dietary pattern and soybean processing in Japan today. *Tropical Agriculture Research Series* No. 17. p. 153-61. March. International Symposium on Soybean in the Tropics and Subtropics. [1 ref. Eng]  
 • **Summary:** Abstract. Consumption of soybeans in Japan. Varieties and processing of soybean foods. Traditional technology for modern products and emerging technology applied to traditional foods. Reference. Discussion. Tables: (1) Intake of Kcal/day/person. (2) Intake of protein/day/person. (3) Intake of fat/day/person. (4) Comparison of intake of nutrients among various nations. (5) Supply and demand of whole soybeans in Japan. (6) Detailed use of whole soybeans supplied for food. Figures: (1) Flow sheet of Momen Tofu preparation. (2) Flow sheet of Kori Tofu preparation. (3) Flow sheet of Shoyu (soy sauce) preparation. (4) Flow sheet of Kome Miso preparation. (5) Flow sheet of soy milk preparation. (6) Manufacture of vegetable protein products. Address: National Food Research Inst., Yatabe, Tsukuba, Ibaraki 305, Japan.

1018. Subden, Ron. 1984. Star Wars soybeans. . . Genetic engineering of soybeans. In: Ontario Soya-Bean Growers' Marketing Board. ed. 1984. Ontario Soybean Symposium. Chatham, Ontario, Canada: OSGMB. 319 p. See p. 296-301. [1 ref]  
 • **Summary:** Contents: Introduction. Classic breeding—The quest for new allele combinations. Mutagenesis—Inducing new alleles. Cell fusions—Hybrids of non-related species. Genetic engineering—Plasmid mediated recombination. Star wars.

By the year 2000 strains of soybeans “will not only be bred but actually constructed by ‘gene machines’ (computers with microprocessors that actually make whole sets of genes) that will literally assemble a genotype to the grower’s specifications. Soybeans all have approximately the same number of genes and the same arrangement of genes within the chromosomes. Different forms of the same gene are called alleles. Sometimes a desired gene for soybean improvement exists in an entirely different plant organism such as a bacterium or yeast. Genetic engineering techniques are now available to cut out the desired gene, and stitch it into a plasmid. Plasmids are small, circular sets of genes that can replicate like a parasite in a host cell. Under certain circumstances, some plasmids can insert themselves into the chromosomes of plant cells. If they carry a desired gene for crop improvement, plasmids then become vectors. Plasmid

borne genes can be inserted into the plant chromosomes and eventually into the seeds and persist through succeeding generations. In such a way, new alleles or new genes can be introduced into the plant germline...

“A soybean gene is a chain molecule composed of a very precise sequence of nucleotides which contains a genetic code. The sequence of a gene can readily be determined by relatively simple procedures. The nucleotide sequence of a virus containing 49000 nucleotides has recently been published. The first gene was constructed in the ‘70s by G. Khorana at the University of Wisconsin. He used literally dozens of technicians and the project took years. Today, one can purchase for \$40,000 (Canadian) a ‘gene machine’ that quickly will make sequences of 10-15 nucleotides... The gene machine construction of a complete gene, say 1500 nucleotides long, is at present quite technically difficult if not impossible. The problem is, however, only technical and will be solved... A complete set of soybean genes is probably around 5-10 thousand genes.” Address: Prof. of Genetics, Univ. of Guelph, Guelph, ONT, Canada.

1019. Suzuki, Steven. 1984. Pacific Rim potential for edible soybeans. In: Ontario Soya-Bean Growers' Marketing Board. ed. 1984. Ontario Soybean Symposium. Chatham, Ontario, Canada: OSGMB. 319 p. See p. 224-41.

• **Summary:** Soybeans were first exported from Canada about 12 years ago when a Japanese house approached the Ontario Soybean Grower’s Marketing Board for a trial shipment to Japan. The trial worked out very well and in a short time Ontario’s soybean exports became a multi-million dollar business. Ontario soybeans are very clean, the quality is comparable to Japanese and Chinese soybeans, and the supply is consistent. However the price is high in relation to Chinese and U.S. soybeans. As a result, Ontario soybeans are sold in high-priced markets, as for making premium quality miso or soyamilk. The supply of Chinese soybeans is irregular. Address: Manager, Grain Trading Section, Okura & Co. America Ltd., New York, NY.

1020. Wang, Hwa L. 1984. Tofu and tempeh as potential protein sources in the Western diet. *J. of the American Oil Chemists' Society* 61(3):528-34. March. [22 ref]

• **Summary:** Contents: Abstract (uses the word “soybean foods” several times). Introduction. Traditional soybean foods. Trends in market growth for tofu and tempeh (based on statistics gathered by Shurtleff & Aoyagi of The Soyfoods Center in California, 1983). Tofu. Tempeh.

Traditional soybean foods can be classified as either nonfermented or fermented. Tables show: (1) Oriental nonfermented soybean foods (gives food name, local names, description, uses): Fresh green soybeans (local names: maotou, edamame). Soybean sprouts (huang-tou-ya, daizu no moyashi). Soybean milk (tou-chiang). Protein-lipid film (tou-fu-pi, yuba). Soybean curd (tofu, tou-fu, tubu, tahoo, touhu,



tau-foo, dou-fu, dau-fu). Soybean flour (tou-fen, kinako) (Wang 1983).

(2) Oriental fermented soybean foods (gives food name, local names, microorganisms used, substrate, nature of product): Soy sauce (local names: chiang-yu, shoyu, toyo, kanjang, ketjap, see-iu). Miso (chiang, doenjang, soybean paste). Hamanatto [fermented black soybeans] (tou-shih, tao-si, tao-tjo [sic]). Sufu (fu-ru, fu-ju, tou-fu-ju, bean cake, Chinese cheese). Tempeh (tempe kedele). Natto.

(3) Tofu industry in the United States (No. of manufacturers and annual production in 1975, 1979, 1981, 1982, and 1983).

(4) Soybean solids and proteins in soybean soak water as affected by soaking conditions (temperature vs. time; Lowry protein / Lowry's protein). (5) Ratio of protein to oil content of tofu and soy milk as affected by protein content of soybeans (for different soybean varieties; the highest ratios come from the varieties Wase-Kogane, Vinton, Toyosuzu, and Coles).

Figures: (1) Flow diagram for the preparation of tofu. (2) Graph: In vitro digestibility of soybean milk as affected by the duration of boiling. Best digestibility is 12-14 minutes. (3) Four graphs: Relationship of concentration and type of coagulant to the yield of tofu. Coagulants are calcium sulfate, calcium chloride, magnesium sulfate, and magnesium chloride. The 4 graphs are: Gross weight of tofu. Moisture content. Total solids recovery. Nitrogen recovery. Calcium sulfate gives the highest values on all four graphs. (4) Four graphs: Relationship of concentration and type of coagulant to the texture characteristics of tofu. Same coagulants. The four graphs are: Hardness. Brittleness. Cohesiveness. Elasticity. (5) Flow diagram for tempeh fermentation. Address: NRRRC, ARS, USDA, Peoria, Illinois 61604.

1021. Watanabe, Atsuo; Ohtani, Toshio; Nikkuni, Sayuki; Baba, Tohru; Ohta, Teruo. 1984. Nattô seizô haisui no ûkôryô ni kansuru kenkyu. I. Gengai roka hôhō ni yoru nattô haisui shori no kôka [Utilization of the drained water from natto processing. I. The efficacy of ultrafiltration treatment of the drained water from steaming of soybeans in natto processing]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 44. p. 112-16. March. [7 ref. Jap; eng]  
Address: 1-3, 5. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 4. Kagoshima State Lab. of Agriculture.

1022. Watanabe, Atsuo; Ohtani, Toshio; Nikkuni, S.; Baba, T.; Ohta, T. 1984. Nattô haisui shori ni okeru gengai roka jôken no kentô [Operating condition of ultrafiltration of the drained water from steaming of soybean in natto processing: Utilization of the drained water from natto processing (II)].

*Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 44. p. 117-21. March. [4 ref. Jap; eng]

• **Summary:** "In order to recover valuable components from the waste water drained from steaming soybeans during natto processing, the operating conditions of ultrafiltration of the supernatant from isoelectric point sedimentation, including washing of the membrane to maintain membrane performance, were studied."

Reprinted from *Nihon Shokuhin Kogyo Gakkai Shi* 29(4):250-54 (1982). Address: 1-3, 5. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Ministry of Agriculture, Forestry and Fisheries, 2-1-2 Kannon-dai, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305; 4. Kagoshima State Laboratory of Agriculture, 5500, Kamifukumoto-cho, Kagoshima-shi, 891-01. All: Japan.

1023. Wernham, Les. 1984. Exports-Problems and opportunities [for Canadian soybeans]. In: Ontario Soybean Growers' Marketing Board. ed. 1984. Ontario Soybean Symposium. Chatham, Ontario, Canada: OSGMB. 319 p. See p. 246-53.

• **Summary:** Soybean exports from Ontario have expanded dramatically during the past 10 years; in 1982 they reached a high of 132,000 tonnes worth \$44 million. The East Asian market including Japan, Korea, Hong Kong, and Malaysia accounted for 81% of Ontario's export soybean sales in 1983, with an additional 8% going to Europe. The main buyers in 1982 were: Japan 47,414 tonnes, Netherlands 19,545 tonnes, Singapore 18,039 tonnes, Indonesia 16,652 tonnes, Hong Kong 15,234 tonnes.

Most of these soybeans are sold for human consumption. "For example, one of Sweden's foremost pharmaceutical manufacturers has in the past years been that country's largest single importer of Canadian soybeans. Taking about 3,000 tons annually, this company produced a patented intravenous nourishment called Intralipid." Tiny soybeans (5 mm diameter or less) are used to make bean sprouts and natto. For soybean exports, freight constitutes an average 21% of the net delivered cost to the buyer in his country. They are shipped in bagged or bulk (20 or 40 foot) containers. The main focus of breeding should be to develop varieties that do not carry a common bitterness or beany flavor. Address: Grain Manager, King Grain, Chatham, ONT, Canada.

1024. Hittle, Carl N. 1984. Re: Preparing kinema in Nepal. Letter to William Shurtleff at Soyfoods Center, April 12. 2 p. Typed, with signature on letterhead.

• **Summary:** "Enclosed is a write up on "Method of Preparing Kinema." Kindest regards. IADS:CNH/hks.

Attached is a single typewritten page which bears the title shown above, and the subtitle "(Special way of taking soybeans in Eastern Nepal and Darjeeling)."

“Wash the soybean and boil it (fluffy boiled until soft). After it is fully cooked, strain the water and mix it with corn dust (maize flour) and put in an airtight bag. Keep it in a place with high temperature for at least 3 days. Some prefer to eat it as soon as it is fermented, some prefer to dry it (in the sun) and keep it for over a year...”

“Method of cooking: For cooking ingredients: Soak in hot water (if dried) for one hour before cooking.

“Cooking ingredients: Oil, onions, tomato and salt (to taste). Heat cooking oil and fry onions; add a pinch of turmeric and the kinema and cook until brown; then add tomatoes and a little bit of water (some prefer to take it as a soup by adding a little more water to the above ingredients) and salt to taste. Continue cooking for about 10-15 minutes. Then it should be ready to be served.

“This information was prepared by Manju Shrestha, February 1984.” Address: Project Supervisor, IADS, International Agricultural Development Service, P.O. Box 1336, Kathmandu, Nepal. Phone: 21425. Cable: Iadservis, Kathmandu.

1025. Sterngold, James. 1984. On foot in Hokkaido: Much of the northern isle is parkland. *New York Times*. April 29. p. XX9, XX32.

• **Summary:** The writer stays at a spa near Mount Asahi. The standard Japanese breakfast begins with a bowl of rice and salty broiled fish, generally salmon. “Then there is natto. This is a gooey, though plain tasting, concoction of fermented soybeans said to be packed with nutrition, but a little much for some sensibilities first thing in the morning. Even many Japanese wrinkle their noses at the mention of natto the way many Americans do the first time they hear of eating raw fish. Also common are raw egg and nori [pressed seaweed], which are eaten with the rice.”

1026. Jacobs, Susan. 1984. The Cultured Club. Fantastic fermented foods. *Vegetarian Times*. April. p. 44-45, 47-48.

• **Summary:** Includes a brief introduction to tempeh, fermented tofu, miso, natto, and tamari soy sauce.

1027. Leviton, Richard. 1984. Japanese soyfoods. In: Camille Cusumano. 1984. *Tofu, Tempeh, & Other Soy Delights*. Emmaus, Pennsylvania: Rodale Press. x + 261 p. See p. 144-49.

• **Summary:** Contents: Brief biography of Leviton and introduction. Deep-fried and grilled tofu treats: age, atsuage, ganmo, yaki-dofu, doufu-gan. Tofu haute cuisine (at 280-year-old Sasa-no-Yuki in Tokyo, dried-frozen tofu, wine-fermented tofu). Delights of soymilk and yuba (incl. Yuba Han). Natto, miso, and savory soy condiments (incl. Hamanatto or “savory fermented black soybeans,” thua nao from Thailand, and natto miso). And still more: Cooked soybeans with wakame, “soy sprouts packed in a sausagelike clear tube, green soybeans in the pods, *kinako* powder (a

flour made from dry roasted soybeans, used as a basis for confections or nut butters), freeze-dried instant miso soup powder, instant silken tofu powder (just add water and stir), and dry meat sauces for tofu.” Address: 100 Heath Rd., Colrain, Massachusetts 01340. Phone: 413-624-5591.

1028. Singh, Minu. 1984. Kinema and other soyfoods in Nepal (Interview). Conducted by William Shurtleff of Soyfoods Center, May 25. 2 p. transcript.

• **Summary:** The name of this fermented soyfood is kinema or kinima (not kenima); it is usually pronounced kee-NAY-muh. The food is most widely consumed in Darjeeling which is now in West Bengal, India (but was formerly part of Nepal) and in southern Nepal. Typical Nepalis who speak Hindi do not know this food, nor is it known in Kathmandu. It is used mostly by non-Brahmins and it has a very strong flavor and smell; she did not like it. She knows how to make kinema because a friend used to make it at her home. Boil soybeans for about 2 hours (in Nepal mostly black soybeans, and in Darjeeling some yellow soybeans are used). Pour the cooked soybeans into banana leaves, cover very tightly, put into a paper bag, then put in a warm place for 5 days. No inoculant was used and at the end of the 5 days she recalls that it “smelled terrible.” Wash the kinema then cook it with tomatoes, ginger and garlic. After cooking it did not smell so bad.

Note: This is the earliest document seen (Oct. 2010) that uses the word “kinima” to refer to kinema, a fermented soyfood from Nepal and a close relative of Nepalese kinema and Japanese natto.

In Nepal, green vegetable soybeans are called *hariyo bhatmas* (*hariyo* means “green” and *bhatmas* is the Nepali word for soybean). They are consumed all over Nepal, boiled in the pods, then the green beans are removed and eaten as is with a little salt as a snack; sometimes they are seasoned with black pepper or hot chili, and sometimes they are used in a curry with potatoes. Whole dry soybeans are soaked overnight then cooked with potatoes.

She worked with the Peace Corps for 9 years as a language coordinator. In about 1980 she worked on a project with the Peace Corps making roasted soy flour at a Nepal maternity home. They called it Poshilo Bito (“Nutrition Flour”). They would mix dry soybeans with some corn, barley and wheat. Roast the mixture, grind it, put it in packets, and distribute it free of charge to the poor and to hospitals. She also taught these people how to make it. To prepare: Mix the flour with boiling milk or water. Address: 2708 Virginia St., Berkeley, California 94709. Phone: 415-848-1481.

1029. Yamanaka, Mitsuaki. 1984. Re: The work of Takashin Ltd. with tempeh in Japan. Letter to William Shurtleff at Soyfoods Center, May. 3 p. [Jap]

• **Summary:** Our company, Takashin, Ltd. (*Takashin*

*Shokuhin*) is a member of the Japanese National Natto Association (*Zenkoku Natto Kyôdô Kumiai Rengokai*). In early 1983, with director Ose's announcement of *Tempe Gannen* (The First Year of Tempeh) we started basic research on tempeh production and on second generation tempeh products—with other members in full force. From the beginning of 1984, under the leadership of our president Makito Takato, we are making progress on marketing and commercialization. We are also consulting with Oita-sensei, the top tempeh researcher in Japan, from the Ministry of Agriculture and Forestry Research Center (*Nosui-sho Shokuhin Sôgo Kenkyû-sho*).

We are now preparing to build a tempeh plant, with tempeh-making equipment, in order to make consistently good quality tempeh at low price for the market.

To answer your questions: 1. In April 1983 our president attended the Association meeting. Since then we have been doing research on tempeh. As a new fermented food in Japan, tempeh appealed to our president's progressive nature. We believe it has many advantages over natto.

2. July 1983. Right after Mr. Kanasuki / Kanasugi of the association returned from Indonesia, we invited him to our company and asked him to teach us how to make tempeh. In Sept. 1983 we started to sell hamburger with tempeh.

3. We are making and selling both tempeh (40 kg/day) and second-generation tempeh foods (20 kg/day)—such as hamburger, croquettes, cutlets, etc.

4. Monthly production is 1,500 kg.

7. We are selling our tempeh and tempeh products through natural foods restaurants and natural foods stores. We tried to test market our products in regular food stores but it didn't sell well because of lack of promotion and publicity. Address: Tachibana 1-29-2, Sumida-ku, Tokyo 131, Japan.. Phone: 048-644-1323.

1030. Hesseltine, C.W. 1984. Re: Eihachiro Kato and natto. Letter to William Shurtleff at Soyfoods Center, June 5. 1 p. Typed, with signature on letterhead.

• **Summary:** "Mr. Eihachiro Kato came to me from Meiji University last September and will be with me until the end of August. He is working with Dr. Wang and me on natto." Address: USDA/NRRC, Peoria, Illinois.

1031. Kira, Motoo. 1984. Re: History of Marukin Shokuhin's work with tempeh. Letter to William Shurtleff at Soyfoods Center, June 8. 5 p. Handwritten, with signature. [Jap; eng+]

• **Summary:** Marukin Foods: The first natto company to start large-scale production of tempeh in Japan was Marukin Shokuhin (Marukin Foods Industry Co. Ltd.). Located in Kumamoto, Kyushu (Japan's southernmost main island), they were (in 1984) one of Japan's Big Five natto manufacturers, and they also made several other foods such as roasted soy flour (kinako), tofu, and konnyaku. In about 1964 Mr. Hayashi of the Japanese-American Soybean

Institute suggested that Marukin start to study tempeh. At that time Marukin was looking for a new product, so Mr. Haruo Kato (the brother of Marukin's president and chief of natto production, research, and development) began with great interest to collect material and investigate this little-known fermented soyfood. Kato obtained tempeh culture from an unknown source in 1964 and was soon making small batches of tempeh. However the company eventually came to believe (incorrectly) that tempeh culture could interfere with the natto fermentation, and taste tests of tempeh led Kato to feel that it might be difficult to introduce tempeh into Westernized diets in Japan. So interest in tempeh waned. In July 1982 Marukin and eleven other small- to medium-sized soyfoods manufacturers from throughout Kyushu joined to establish the Kyushu Soyfoods Industry Association (*Kyushu Daizu Shokuhin Kogyo Kumiai*). Marusan's president, Itsuo Kira, became head of the cooperative Association. To help them compete with larger companies, and supported by Japanese government aid, they built a large and modern factory (6,600 square meters), with a daily capacity of 15 tonnes of natto and 6 tonnes of kinako and soy soup base (*gojiru no moto*). In April 1983, this new natto factory, the largest in Japan, started production, employing 85 workers. Marukin decided to use its former natto factory to make tempeh, since there was a growing interest in soyfoods and healthful foods, and since they already had extensive experience in making fermented soyfoods. In November 1983 Marukin Foods launched SunSeed brand tempeh. An article on the product in the 1 December 1983 issue of the *Japan Food News (Nihon Shokuryo Shimbun)* was headlined "nonsticky natto" and by May 1984 they were selling 1,500 packs of 200 gm each (300 kg) daily, about 4,620 lb (2,100 kg) a week or 9,150 kg a month. They were also developing secondary tempeh products, including snack foods, paste-type foods, and fried foods. The person in charge of tempeh production and sales was Moto-o Kira, eldest son of the president, Itsuo Kira, and next to top man in the company. Marukin sold its tempeh in department stores and in supermarkets at their own in-store booths. To promote tempeh, the company employed two professional nutritionists to do demonstrations and lectures at cooking classes. Marukin soon hopes to sell tempeh to school lunch programs. Address: Manager, tempeh production, 380 Yoyasu-machi Kumamoto-shi 860, Japan. Phone: 096-325-3232.

1032. Kato, Eihachiro. 1984. Re: Work with natto at the NRRC and in Japan. Work with tempeh in Japan. Letter to William Shurtleff at Soyfoods Center, June 18. 2 p. Handwritten on lined paper; 3 p. transcript. [Jap; eng+]

• **Summary:** In Oct. 1983 the author started doing research on natto under Drs. Hesseltine and Wang at the Northern Regional Research Lab. in Peoria, Illinois. In Japan, the soybeans used to make natto are grown mostly in Japan

or China. U.S. soybeans are believed to be unsuited for making natto since they remain hard after cooking, and they produce natto that has less sweetness and stickiness (*nebari*) than desired. He is now trying to find U.S. soybeans suited to making natto. He has found that the environment and conditions under which the soybeans are grown has more influence on the natto than the varieties themselves. He thinks that natto has many potential uses in a dried powdered form that could be mixed with other foods. He plans to return to Japan in late Aug. 1984. He has an extensive collection of publications on natto, which he is willing to share.

In Japan, he teaches at Meiji University in the agricultural chemistry dept., fermented foods research lab. He worked under Dr. Masahiro Nakano for a long time when he was there. His father (Haruo Kato) and brother (Itsuo Kira) produced natto after World War II in Kumamoto prefecture, Kyushu. They also tested tempeh for about 15 years. Their company is named Marukin Shokuhin Kogyô K.K. In July 1983 they established the Kyushu Soyfoods Association (*Kyûshû Daizu Shokuhin Kogyô Kumiai*) with Japanese government aid, and in Uto-chi, Kumamoto prefecture, they built a new plant. Marukin shokuhin is mainly handling the sales. Mr. Kato has no direct connection with Marukin. Address: NRRC, Peoria, Illinois.

1033. Bo, Thi-an. 1984. Tôshi no engen to sono seisan gijutsu ni tsuite [On the origins of fermented black soybeans [douchi] and their production technology. I and II.]. *Nippon Jozo Kyokai Zasshi (J. of the Brewing Society of Japan)* 79(4):221-23. April; 79(6):395-402. June. [7 ref. Jap]

• **Summary:** A definitive history of the subject. Includes a discussion of *shuidouchi*, which might be called salted Chinese natto; it is fermented with *Bacillus subtilis* and made in Shandong province in China—directly west of South Korea. Address: Iwate Daigaku Nôgaku-bu, Sogaku 80 shunen no gosukui ni kaete; Present address, China.

1034. Kanasugi, Goro. 1984. Re: Work with tempeh in Japan. Letter to William Shurtleff at Soyfoods Center, June. 4 p. Handwritten, with signature. [Jap]

• **Summary:** Mr. Kanasugi, vice president of the Japan Natto Assoc., started a soyfoods restaurant named Mame-no-ko (“child of the soybean”) in Omiya city, Saitama prefecture. By mid-1983 he was serving tempeh there as an alternative to meat in various side dishes: tempura, harumaki (spring rolls), karinto (sweet fried dough cake), curried sauce, sauteed vegetables, croquettes, and various others. He also sells ready-to-eat tempeh dishes at his take-out deli. Many of his recipes contain 10-20% chicken or meat.

Mr. Kawashima of Tsukuba told him that his tempeh has a very good flavor. Lots of big Japanese companies are now looking at tempeh manufacturing. Address: Shimo-cho 3-6, Omiya-shi, Saitama-ken 330, Japan. Phone: 048-644-1323.

1035. Watanabe, Tokuji; Kishi, Asako. 1984. The book of soybeans: Nature’s miracle protein. New York, NY: Japan Publications. 191 p. June. Illust. General index. Recipe index. 26 cm. [21 ref]

• **Summary:** Contents: Introduction. Part 1. General information: 1. Characteristic traits: Agronomic and other biological characteristics, physical properties, chemical properties, soybean protein, properties of soybeans as food material. 2. Current ways of using and processing soybeans: Throughout the world, traditional ways of using and processing, new soybean food products. 3. Tofu and other nonfermented soybean food products: Tofu, deep-fried tofu, dried-frozen tofu, soy milk, yuba, roasted soy flour (kinako), soybean sprouts. 4. Miso and other fermented soybean products: Miso, natto, Hama-natto (tera-nattô), soy sauce, sufu, tempeh. 5. Other ways of eating soybeans—Simple traditional Japanese foods: Parched soybeans, boiled soybeans (*budo-mame; hitasahi mame*), beaten and mashed [or ground] soybeans (*go*, or (from edamamé) *zunda or jinda*), molded soybean mash (*jinta-dôfu*), molded mashed soybeans and rice flour (*shitogi*), soybean soybean-mash paste. 6. New soybean protein products.

Note 1. This is the earliest document seen (Nov. 2008) that mentions *zunda*. The text (p. 84) reads: “When fresh green soybeans (edamame) are used in cooking, they are boiled for from ten to twenty minutes; ground; and flavored with salt, sugar, and soy sauce. The resulting dish is called *zunda* or *jinda*.”

Note 2. *Zunda* is a healthy and tasty snack or treat made from mashed edamamé. It is sweet, rich in protein, high in fiber and emerald green. It is said to have originated hundreds of years ago in Japan in Miyagi prefecture. In and around Sendai (capital of Miyagi prefecture) one can find many shops and booths that sell *zunda* cakes, *zunda* mochi treats, and *zunda* shakes, all made from edamamé (green vegetable soybeans). One well-known company in Japan that markets delicious *zunda* products is Zunda Saryo.

Part 2. Cooking with soybean food products: Tofu, yaki-dofu, kori-dofu, nama-age, abura-age, gammodoki, yuba, natto, miso, soy milk, soybeans, bean sprouts. Afterword. Bibliography.

In the chapter on tofu, pages 43-44 discuss *okara* or *unohana* (the residue remaining after soy milk production); a photo shows it in a glass bowl. “Though it formerly appeared on many Japanese tables seasoned and cooked with vegetables, today it is most often fed to animals. As the number of animals raised in urban and suburban areas decreases, however, tofu manufacturers are finding it harder to dispose of residue.”

Page 99 notes of tofu: “At a certain temple in Kyoto is a plaque bearing the following inscription, which, while comparing this food to religious faith, clearly shows the esteem in which the Japanese people hold tofu. ‘Religious faith should be like tofu: it is good under any circumstances.

It is good boiled, grilled, or fried. Raw, chilled, served with soy sauce and other seasonings, it is good with steamed rice. Simmered in hot water and flavored, it is good with sake. Because it is soft, old people and sick people welcome it, but children and young people like it too. Men like it, women like it; poor and rich both like it. Though common, it has elegance enough to find a place in the upper class.

“It cuts clean and well for use in clear broths. It is good in the meatless diets of religious training. It can be crushed for use in miso soup. It is used all the time and in all seasons. It is inexpensive yet numbered among the delicious treats. It is welcomed everywhere, in mountains as well as in big cities. It is well received at dinners for dignitaries and guests yet is convenient enough for college students who do their own cooking. Women especially should be like tofu. The mature and cultivated person should be tender, yet firm, like tofu. Though apparently tasteless, it is delicious. Though apparently ordinary, it is extraordinary.”

Other ways of eating soybeans (p. 83-84): (1) Parched—“Parched gently in unglazed ceramic dishes made for the purpose,” then tossed by people at Sestubun in February around their houses as they chant “‘Demon out! Good luck in!’ Then they pick up the beans and eat them. Parched soybeans are included in some varieties of *mochi* (glutinous rice cake) and in *okoshi* a confection made of puffed rice bound together with sugar syrup. In the past they were eaten with salt, miso, or soy sauce.”

Note: In the USA, parched soybeans are called “dry roasted soynuts.”

Tables show: (1) World production of soybeans (1977-1982). (2) Price trends in dollars per ton for wheat, soybeans, and corn (1970-1981). (3) Soybean yields in the USA and Japan (1974-1981). (4) Chemical composition of soyfoods: Tofu, abura-agé, *kôri-dôfu*, yuba, kinako, soybean sprouts, *nattô*, miso (dark yellow), soy sauce (common), soybean (Japanese). (5) Statistics on production of modern soybean products in Japan (1975-1981). (6) Annual production and prices of modern soy protein products in the USA (May 1983).

Japan once produced a million tonnes (metric tons) of soybeans annually. This figure decreased dramatically during World War II. After the war, as soybean imports from the United States steadily increased, Japan’s domestic crop gradually fell to the level of no more than 100,000 tonnes. In 1977 it was 111,000 tonnes, yet by 1982 it had jumped to 226,000 tonnes as rice acreage was reduced.

All photos are black and white. Figures show: (2) Line drawing of soybean plant with flowers and leaves. (2) Cross section of soybean seed-coat and cotyledon. (3) Graph of protein solubility (NSI) of defatted soybean meal at different pH values. (4) Graph of protein solubility (NSI) of defatted soybean meal at different concentrations of calcium chloride. (5) Graph of relationship between time and temperature of soaking soybeans in water (colder water temperature requires

longer soak time). (6) Flow sheet for making regular tofu. (7) Photo of regular (*momen*) “cotton tofu.” (8) Line drawing of grinder (horizontal type) used with soaked soybeans when making tofu. (9) Photo of continuous filter for soy-milk preparation. (10) Photo of small-scale soy-milk processing plant. (11) Line drawing of molding box [forming boxes with lids] for making regular tofu. (12) Photo of *yaki-dofu* [grilled tofu]. (13) Photo of *okara* in a glass cup. (14) Line drawing of molding box [forming box] for silken tofu. (15) Photo of silken tofu. (16) Flow sheet for packaged tofu production [GDL]. (17) Photo of packaged tofu in package. (18) Flow diagram of large-scale process for making tofu and *abura-age* with 26 pieces of equipment labeled. (20) Flow diagram of continuous process for making packaged tofu [GDL]. (21) Photo of 2 pieces of *abura-agé*. (22) Photo of deep fryer for making *abura-agé*. (23) Photo of *nama-agé* [deep fried tofu cutlet]. (24) Photo of two types of *ganmodoki*. (25) Line drawing for tofu kneader for *ganmodoki* production. (26) Photo of *kôri-dofu* [dried frozen tofu]. (27) Flow sheet for making dried-frozen tofu. (28) Flow diagram of process for making large-scale dried-frozen tofu. (29) Photo of aseptic carton and glass of soy milk. (30) Flow sheet for making aseptically packaged soy milk. (31) Photo of 5 different forms of dried *yuba*. (32) Photo of *kinako* in two clear glass bowls. (33) Photo of soybean sprouts in a woven bamboo basket. (34) Flow sheet for making miso. (35) Three different types and colors of miso on 3 bamboo rice paddles (*shamoji*). (36) Line drawing of cut-away view of traditional pressure cooker (*koshiki*) for rice cooking. (37) Diagram of continuous rice cooker with 7 parts labeled. (38) Line drawing of *Aspergillus oryzae* with conidia (spores), sterigmata, and mycelium labeled. (39) Photo of pieces of *koji*. (40) Diagram of modern fermentation room for making *koji*. (41) Cut-away view of miso fermenting in a wooden vat with stone weights above vinyl film on top. (42) Line drawing of a mashing machine for miso. (43) Photo of *natto* in rice straw wrapper and polystyrene tray. (44) Cross sectional view of pressure cooker for soybeans. (45) Line drawing of rotating mixer to combine cooked soybeans with pure-cultured *Bacillus natto*. (46) Photo of soy sauce table dispenser. (47) Flow sheet for making Japanese soy sauce (*shoyu*). (48) Transparent view of crusher (roller) for roasted wheat in making soy sauce. (49) Photo of modern stainless steel fermentation tanks / vats (indoors). (50) Photo of a jar and a cup of *sufu* [fermented tofu]. (51) Diagram showing relationships between modern soy protein foods.

Note: Surprisingly, *edamamé*, one of the most popular soyfoods in Japan, is mentioned only once, in passing (p. 84) in this book.

Photos on the rear cover show Tokuji Watanabe and Asako Kishi. A brief biography of each is given.

Tokuji Watanabe: Born in 1917 in Tokyo, he graduated from the Faculty of Agriculture of Tokyo University in 1941, with Doctor of Agriculture. In 1945 he entered the National

Food Research Institute (NFRI), of which he became director in 1971. In 1977 he resigned that position and became a professor at the Kyoritsu Women's University, where he now teaches. Address: 1. D. Agr., Kyoritsu Women's Univ., Tokyo.

1036. *Toyo Shinpo (Soyfoods News)*. 1984. [Good quality natto maker invented a new method to produce old fashioned flavor; high quality natto]. July 21. [Jap]

• **Summary:** The company name is Hōya Natto K.K. [Hoya Natto], Aoba-cho 2-39-9, Higashi Maruyama-shi, Tokyo, Japan. Phone: 0423-94-6600. The company has 75 workers. Capital: 9 million yen. Capacity: 200,000 packages/month.

Mr. Kiuchi believes that natto should be fermented slowly, for a long time, just like it was made in traditional farmhouses. Ten years ago when he built the new plant, he started to use *issanka tanso* and to slowly increase the fermentation time. Present commercial manufacturers typically ferment their natto for 13-15 hours.

His new process produces stickier and stronger flavored old-fashioned natto. His natto is getting popular among lovers of natto and of natural foods. In this term his sales rose 50% to 430 million yen. He uses only Japanese soybeans which are 3 times as expensive as imported Chinese soybeans. He also uses a method which requires strict control of the temperature of water—which he thinks is very important. He sets the water temperature at 7°C in winter. He calls this method *sumibi zukuri* (which is also his brand). He mainly uses rice straw, kyōgi bamboo shoot peels, and Japanese rice paper for packages [instead of plastic trays].

1037. Kira, Motoo. 1984. Re: More history of Marukin Shokuhin's work with tempeh. Letter to William Shurtleff at Soyfoods Center, Aug. 4. 4 p. [Jap; eng+]

• **Summary:** Answers to Shurtleff's questions: (1) From the end of last year until the beginning of this year, Marukin was making 1,800 kg/week of tempeh. However presently (July 1984) they make only 15 kg/month in order to use it for developing second generation food. They have stopped making tempeh for the general market.

(2) Marukin's president is named Itsuo Kira.

(3) In July 1982 the twelve manufacturers of natto, kinako, and *gojiru no moto* in Kyushu all got together and founded the *Kyushu Daizu Shokuhin Kogyo Kumiai* (Kyushu Soyfoods Association). In April 1983 we built a large plant in Uto / Udo city on the outskirts of Kumamoto city. The capacity of the plant for making natto is 250,000 shoku per year (1 shoku = 100 kg; so 25 million kg/year). And kinako and *Gojiru no moto* is 6 tons. Marukin makes 80% of the total production of this plant, and the plant is run by Marukin's people with Marukin's technical assistance.

(4) As I wrote you in my last letter, Mr. Haruo Kato took charge of researching and developing new fermented

soyfoods. He was also very interested in tempeh and was doing tempeh research and development when he died on 3 Dec. 1983. He did not leave clear records of the history of his work with tempeh. However his records show that in about 1950 he experimented with making tempeh. In 1963 in Kumamoto he attended a lecture given by Mr. Dr. Iwao at the National Nutritional Research Center and Dr. Kato became deeply interested in the subject of that lecture, "A growth quickening factor in tempeh." He again started his research on tempeh, and in Feb. 1964 Hayashi-kaicho (a leader) and he tried to get a copy of Dr. Iwao's paper as well as tempeh starter culture. "I am sending you the article that was sent by Hayashi-kaicho to Mr. Kato." Address: Manager, tempeh production, 380 Yoyasu-machi Kumamoto-shi 860, Japan. Phone: 096-325-3232.

1038. Kanasugi, Goro. 1984. Re: More on work with tempeh in Japan. Letter to William Shurtleff at Soyfoods Center, Aug 7—in reply to questions. 2 p. Handwritten. Plus 4 p. translation. [Jap]

• **Summary:** To answer your questions: (1) Mame-no-ko restaurant and deli opened on 10 Feb. 1977. (2) Tempeh started to be served at Mame-no-ko in late May 1983. "I got tempeh starter from Teruo Ota sensei and soon tried to make tempeh. It turned out well and the first dish served was tempeh sauteed with vegetables.

(3) My natto and tempeh plant is located about 150 meters (500 feet) away from Mame-no-ko. We make tempeh there about once a month. (4) At Mame-no-ko we use tempeh once or twice a week in various dishes; we use 15-20 kg/month.

(5) At our plant we make 100 to 200 kg/month of tempeh, entirely for use in second generation soyfood products. (6) I would estimate that, on average, about 500 people per day eat the tempeh we make, both at the restaurant and deli and from retail stores.

(7) I depend on Ota sensei for tempeh starter so I don't know who makes tempeh starter in Japan. Soon the research center for making cultures in Tokyo will start making tempeh starter. (8) I think that Takashin started to make tempeh in about Aug. 1983, and that they now make about 50-100 kg/month.

(10) I am enclosing a copy of a *Shin Eiyō* magazine article about tempeh.

Here is my recipe for tempeh jam. I have just received very big news. The Japanese government has announced that it will help development and popularization of tempeh in Japan. They told the Japanese Natto Association that they will lend ¥8.7 million as part of a program to promote practical use of new technologies. Address: Shimo-cho 3-6, Omiya-shi, Saitama-ken 330, Japan. Phone: 048-644-1323.

1039. Shurtleff, William. 1984. Japan's first and largest tempeh companies. *Soyfoods*. Summer p. 30-32.

• **Summary:** Discusses: Ryoji Nakazawa (a microbiologist; the first Japanese to study tempeh and publish information about it, in 1928). Department of Applied Microbiology, established in 1944 within the National Food Research Institute. The Food and Nutrition Laboratory at Osaka University (late 1950s and early 1960s).

Torigoe Flour Milling Co. (Torigoe Seifun, Kyushu University's Dep. of Food Science and Technology, Kazuhiro Takamine). Takamine goes to study tempeh at the University of Minnesota's Dep. of Food Science and Nutrition under Dr. William Breene and with PhD candidate Abdul Ribai. Returning to Japan, Takamine develops an improved type of tempeh. In June 1983 Torigoe starts making tempeh at their Fukuoka flour mill in a pilot plant that cost \$50,000 and had a capacity of 33,000 lb/month of tempeh. They make the key decision not to sell plain tempeh but rather two semi-prepared products, both called Gold Tempeh. By early 1984 Torigoe was making 24,200 lb/month of tempeh—making it the world's sixth-largest tempeh maker.

Marusan-Ai, one of Japan's most dynamic and forward looking food companies, started in early 1984.

Two large natto companies began making tempeh in early 1984: Marukin Shokuhin Kogyo in Kyushu, and Takushin in Tokyo—both prompted by the Japan Natto Association's promotional work for tempeh.

Note: This article is an excerpt from "The Tempeh Revolution in Japan," by William Shurtleff, who is now writing a History of Tempeh (worldwide). Address: Soyfoods Center, P.O. Box 234, Lafayette, California.

1040. Beversdorf, W.D. 1984. Development of new soybean varieties for soy foods [in Canada]. In: Ontario Ministry of Agriculture and Food, Market Development Branch. 1984. Workshop on Export Markets for Ontario Soybeans: Edited Proceedings. 45 p. See p. 18-20. Held 5 Sept. 1984 at Wheels Motor Inn, Chatham, ONT, Canada. 28 cm.

• **Summary:** "Historically, soybean breeding efforts in Canada have been directed toward improving yields, increasing the area of adaptation (to shorter season and cooler geographic areas) and improving pest tolerance. As soybean production has increased toward domestic self-sufficiency, the industry has placed more emphasis on development, production, and marketing of special quality beans for specific non-oil export markets..."

"In Canada, yield of soybeans per unit land area has remained a primary consideration in soybean breeding (except for natto-type beans) because of licensing requirements for pedigreed seed production and marketing. Among high yielding breeding lines, large seed size, white or yellow hilum colour and high seed quality (resistance to discolouration and cracking) are common selection criteria associated with tofu and miso export potential."

Canadian soybean breeders are generally aware of the characteristics defined during the 1982 "Soybean Export

Mission to South East Asia" for various soyfood uses. These desired soybean characteristics are shown in Table 1 for natto, miso, tofu, soymilk, and soy sprouts. Address: Assoc. Prof., Univ. of Guelph, Guelph, ONT, Canada.

1041. Chen, Steve. 1984. Soyfoods in the Far East and USA: Products, markets, trends. In: American Soybean Assoc., ed. 1984. First European Soyfoods Workshop, Proceedings. Brussels, Belgium: ASA. 36 p. See p. C1-C38. Held Sept. 27-28 at Amsterdam, Netherlands. [11 ref]

• **Summary:** Contents: Summary. 1. Introduction: Ten reasons why soybeans will be a key protein source for the future. 1. Soyfood products. A. Non-fermented soyfoods: Fresh green soybeans, soybean sprouts, soynuts, soymilk, soy flour, yuba or soy protein film, tofu. B. Fermented soyfoods: Soy sauce, miso, tempeh, natto, fermented tofu, fermented black soybeans (tou-shih, hamanatto). 3. Soyfoods markets and trends in the Far East: Taiwan, China, Japan, South Korea, Indonesia, Malaysia, Singapore, Thailand, Philippines. 4. Soyfoods markets and trends in the U.S. 5. References. Plus 15 tables and 8 figures.

"It is our [American Soybean Association's] strong intention that marketing and consumption of soy protein should not in any way deter the expansion of the production and sale of as much animal protein as the world can be expected to produce in the years ahead. Soy protein foods are being intentionally brought to the market to complement and not necessarily to replace animal protein products."

"Taiwan imported 1.41 million tonnes (metric tons) of soybeans in 1983 and used about 250,000 tonnes as soyfoods for direct human consumption, which made Taiwan one of the highest in per capita consumption of soyfoods (13.2 kg or 29 lb) in the world. In the past 10 years (1974-1983), the consumption of traditional soyfoods showed an average increase of 3% per year as compared to 12% and 8.1% for poultry and soy oil, respectively. The market for packaged soymilk, soy pudding and tofu has also been expanding rapidly in recent years in Taiwan." Table 7 shows the production of soymilk in Taiwan, which grew from 103,600 tonnes in 1974 to 210,000 tonnes in 1983, for an average growth rate of 8.2% a year.

China produces about 9 million tones of soybeans a year, and about half of these are consumed as soyfoods, giving a per capita consumption of 4.5 kg of soyfoods.

"An improvement in the general economy and soyfood technology and equipment will bring a sharp increase in soybean demand and more soyfoods consumption."

In South Korea soymilk consumption has increased more than seven-fold in the last 4 years. Currently about 10,000 tonnes of soybeans are used to make 70,000 tonnes of soymilk. "It is projected that soymilk production in Korea will double in 1984 as compared to the previous year."

Indonesia continues to be Southeast Asia's largest consumer of soybeans as food. In 1982/83 soybean

consumption was 6.7 kg per capita. Indonesia consumes about 1 million tonnes of soybeans annually, 60-65% of them in the form of tofu and 35 to 40% as tempeh.

Malaysia consumes only about 30,000 tonnes of soybeans per year as food. In Singapore, more than 75% of the population of 2.5 million are Chinese. Therefore tofu, soysauce, and soymilk are the predominant traditional soyfoods consumed.

Thailand consumes about 40,000 tonnes of soybeans a year as food, mainly in the form of tofu. The Philippines uses only 5,000 tonnes of soybeans annually for food, mainly as tofu.

To summarize (Table 6), annual per capita consumption of soybeans in various East Asian countries, in descending order of the amount consumed, is as follows: Taiwan 13.2 kg (population 19 million); Japan 8.3 kg (population 120 million); South Korea 7.5 kg (population 40 million); Indonesia 6.7 kg (population 150 million); Singapore 6.25 kg (population 2.4 million); China 4.5 kg (population 1,000 million); Malaysia 2.1 kg (population 14 million); Thailand 0.8 kg (population 50 million); Philippines 0.3 kg (population 15 million). Address: Director, American Soybean Assoc., Room 603, Kwang-Wu Building, No. 386, Tun Hua South Road, Taipei, Taiwan.

1042. Dirar, Hamid A. 1984. Kalwal, meat substitute from fermented *Cassia obtusifolia* leaves. *Economic Botany* 38(3):342-49. Sept. [10 ref]

• **Summary:** In recent years there has been an increased interest in leaf protein as a potential source to “help alleviate the world shortage in protein.” The leaves of certain plants have been clearly shown to contain significant levels of protein.

In the Sudan, the green leaves of *Cassia obtusifolia* are fermented to produce a food product, kalwal, used by certain ethnic groups as a meat substitute. The fermentation takes about 2 weeks, then the product is sundried and used when needed. Kalwal contains about 20% protein on a dry weight basis. The two main microorganisms active in the fermentation are *Bacillus subtilis* and a species of *Rhizopus* fungus.

Note: Letter (e-mail) from Lorenz Schaller of Ojai, California, who sent this article to Soyinfo Center. 2012. Jan. 30. “*Cassia obtusifolia* has the common name ‘sickle-pod senna.’ I have grown the plant and have color transparencies of it.

“The seeds are roasted to make a medicinal tea (*habucha*) sold in packages in every Japanese grocery store. I once had a package on my exhibit table at a conference and Aveline Kushi walked by, stopped, pointed to the *habu* and said, ‘That’s my favorite tea. I have it every day.’

“The seeds (raw, unroasted) are used in place of yarrow stalks for casting the ancient oracle—*I Ching*. I keep a bottle of them in the cupboard for that use.” Address: Dep.

of Agricultural Botany, Faculty of Agriculture, Univ. of Khartoum, Khartoum, Sudan.

1043. Hara, Toshio; Shiraishi, A.; Fujii, H.; Ueda, S. 1984. Specific host range of *Bacillus subtilis* (*natto*) phages associated with polyglutamate production: Note. *Agricultural and Biological Chemistry* 48(9):2373-74. Sept. [17 ref. Eng]

• **Summary:** On the surface of natto is a “viscous material consisting of polysaccharide (a levan-form of fructan) and polyglutamate (PGA).” PGA consists of L- and D-glutamate in varying proportions.

“The host range of bacteriophages isolated from an abnormal fermented ‘natto’ completely coincides with the 5.7-kb [kilobase molecular weight] plasmid-harboring strains of *Bacillus subtilis* (*natto*). These findings have led to the suggestion that the infective bacteriophages for *Bacillus* species which can produce PGA as a capsular or extracellular mucilaginous material might recognize PGA as a receptor on phage adsorption.” Address: Dep. of Food Science & Technology, Kyushu Univ., Hakozaki, Fukuoka 812, Japan; 2-3. Faculty of Home Life Science, Fukuoka Women’s Univ., Kasumigaoka, Fukuoka 813.

1044. Hayashi, Nobu. 1984. Users’ requirements [of soybean varieties] for natto and tofu. In: Ontario Ministry of Agriculture and Food, Market Development Branch. 1984. Workshop on Export Markets for Ontario Soybeans: Edited Proceedings. 45 p. See p. 12-14. Held 5 Sept. 1984 at Wheels Motor Inn, Chatham, ONT, Canada. 28 cm.

• **Summary:** From January to June 1984 soybeans imported to Japan from the USA had the lowest CIF price (US\$331.31 per tonne), followed by soybeans from China (\$350.16), with Canadian soybeans being the most expensive (\$408.62).

The preferred characteristics of soybeans for natto are: Small in size, round in shape, and clear hilum. Beans should have a firm skin (seed coat) free of cracks. High sugar and amino acid contents. High carbohydrate and low calcium contents. “However the real suitability of the soybeans is determined by the taste of the natto.”

The preferred characteristics of soybeans for tofu are: High protein and low oil contents, especially a high nitrogen solubility index (NSI) which affects the yield of tofu. The larger the seed size the better. Hilum color is not a big problem but a light-colored hilum is preferred since it may give a whiter tofu. A thin and firm skin (seed coat) which reduces the soaking time required. “Like natto, the real suitability is known only when the tofu is tasted.” For all soybeans, it is very important that the price be competitive. Address: Gomei Shoji Co., Tokyo, Japan.

1045. Kanno, Akishige; Takamatsu, H.; Takano, N. 1984. Nattô ni kansuru kenkyû. II. [Studies on natto. II. Determination of several volatile components produced by *Bacillus natto* in commercial natto]. *Nippon Shokuhin Kogyo*



*Gakkaishi (J. of the Japanese Society for Food Science and Technology)* 31(9):587-95. (Chem. Abst. 102:4669). [37 ref. Jap; eng]\*

Address: Asahi Shokuhin Co. Ltd., 180-2 Wado, Ushiborimachi, Namekata-gun, Ibaraki-ken, 311-24 Japan.

1046. Loh, Michael. 1984. An overview of export markets for edible soybeans. In: Ontario Ministry of Agriculture and Food, Market Development Branch. 1984. Workshop on Export Markets for Ontario Soybeans: Edited Proceedings. 45 p. See p. 1-9. Held 5 Sept. 1984 at Wheels Motor Inn, Chatham, ONT, Canada. 28 cm.

• **Summary:** "Ontario first exported edible soybeans in 1972 and over 12 years have built it into a \$40 million business. 1981 was our best year when exports totalled \$46 million... The bulk of Ontario's soybean exports are sold to the Far East [East Asia]-Japan (\$8 million in 1983), Singapore (\$6 million), Hong Kong (\$3.5 million), Malaysia (\$1 million), Indonesia, and Korea." In these countries soybeans are consumed in the daily diet of the people. In Japan, for example, they are made into miso, tofu, natto, soymilk and shoyu. Korea also makes soy sprouts, Indonesia makes tempeh, and Singapore, Malaysia, and Hong Kong make dried yuba. In addition, sales to the Netherlands, United Kingdom, and France are quite significant.

Concerning Ontario's market share of soybean imports for food use: Japan imports 877,300 tonnes, of which 27,000 tonnes or 3.1% is from Ontario. Singapore and Malaysia import 36,000 tonnes, of which 20,000 tonnes or 55.0% is from Ontario. Hong Kong imports 20,000 tonnes, of which 10,000 tonnes or 50.0% is from Ontario.

Japan's sources of its 877,300 tonnes of imported soybeans are as follows: USA 570,000 tonnes (65%), China 280,000 (32%), Canada 27,000, South America 300.

Japan uses its 877,300 tonnes of imported soybeans as follows: tofu 485,000 tonnes (55.3%), miso 180,000, natto 185,000, soymilk 25,000, cooked soybeans 10,000, shoyu 6,500, other 85,800. Within these figures, Ontario's soybeans are used as follows: Miso 20,000 tonnes (11.1% of the total), natto 5,000 tonnes (5.9%), and tofu 2,000 tonnes (0.4%). Address: Export Development Specialist, Ontario Ministry of Agriculture and Food, Toronto, Canada.

1047. Ontario Ministry of Agriculture and Food, Market Development Branch. 1984. Workshop on export markets for Ontario soybeans: Edited proceedings. Ontario, Canada. 45 p. Held 5 Sept. 1984 at Wheels Motor Inn, Chatham, ONT, Canada. 28 cm.

• **Summary:** Contains 9 chapters by various authors, most cited separately. Address: Ontario, Canada.

1048. *Toyo Shinpo (Soyfoods News)*. 1984. Dentô no aji o sekai ni: Nattô no yosa PR [Traditional taste to the world: Promoting natto's good points]. Oct. 3. [Jap]

• **Summary:** Contains one large photo of women in a factory apparently packaging natto.

1049. Nakamura, Masao. 1984. Natto gets its due. *Daily Yomiuri (Japan)*. Oct. 13.

• **Summary:** Although more and more foreigners are becoming fond of Japanese food (such as sushi, instant ramen, sashimi, tempura), few are willing to eat natto (fermented soybeans). "Even many Japanese reject natto for its odd flavor and goopy consistency.

"But during the Tsukuba Expo '85 next July at Tsukuba Science City, Ibaraki-ken, an international conference on natto is to be held.

"Natto is salt-free, like Indonesia's 'tempe' and Nepal's 'kinema.' The three are based on fermented soybeans and form a dietary culture common to East Asia."

A small round portrait photo shows Masao Nakamura. Address: Staff writer, Japan.

1050. *Yomiuri Shinbun (Yomiuri Daily News, Tokyo)*. 1984. Nattô sekai ni [Natto is marching into the world]. Oct. 24. [Jap]

• **Summary:** This article is about tempeh in general and about the world conference on Asian non-salted fermented foods in July 1985 in Tsukuba, Ibaragi prefecture, Japan.

Prof. Watanabe Tadao (Kyushu University) is the head of the conference. They are planning to invite specialists from Thailand, Indonesia, Nepal, China, Korea, USA, Holland, and Denmark.

The wife of Mr. Kawashima (of Tsukuba University) has been developing tempeh recipes suited to Japanese tastes. This subject was on HNK TV on the 6:30 p.m. "News Center 630," on Oct. 17, 1984. Mrs. Kawashima got interested in tempeh when she was living in Indonesia with her husband (a food researcher); they lived there for a long time.

Photos show: (1) A traditional Indonesian tempeh maker in his shop. (2) Mrs. Kawashima holding a plate of prepared tempeh.

1051. Taira, Harue. 1984. Kokusan daizu no hinshitsu. VI. Zenkoku-san daizu no hinshitsu, seibun, kakô tekisei no hendô to chiikikan, hinshukan sai [Quality of soybean seeds grown in Japan. VI. Regional and varietal differences in the physical properties, chemical composition, and suitability for food processing]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 45. p. 55-62. Oct. [9 ref. Jap; eng]

Address: National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 3-4. Hokkaido Prefectural Central Agric. Exp. Station, Naganuma, Hokkaido.

1052. Macrobiotic Wholesale Co. (The). 1984. Catalog and price list [Mail order]. 92 McIntosh Road, Asheville, NC

28806. 63 p. 28 cm.

• **Summary:** The catalog, effective 15 Oct. 1984, contains 450 new products from 15 new vendors, plus 73 new books. The president of the company is Don DeBona. Soy-related products include miso, shoyu, tamari, nigari, kinako, natto and koji spores, black soy beans, tekka, Ah Soy soy drink (soymilk), and amasake.

One of the many suppliers is The Mitoku Co. Ltd., which "was founded in Tokyo [Japan] in 1968 by Mr. Kazama at the express behest of Michio and Aveline Kushi. In fact, the company was named after MI-chio and TO-moko (Aveline's real name; Aveline was given her name by George Ohsawa) KU-shi." Address: Asheville, North Carolina. Phone: 800/438-4730 or 704/655-1056.

1053. Hittle, Carl N. 1984. Re: Kinema in Nepal. Letter to William Shurtleff at Soyfoods Center, Dec. 19. 1 p. Typed, with signature on letterhead.

• **Summary:** "I have located someone who knows considerable about natto and is presently doing some research on it. He is Dr. Tika Karki, Chief, Quality Control

and Standardization Division, Central Food Research Laboratory, Babar Mahal, Kathmandu, Nepal."

"You may wish to write him directly." IADS:CNH/hks. Address: Project Supervisor, IADS, International Agricultural Development Service, P.O. Box 1336, Kathmandu, Nepal. Phone: 21425. Cable: Iadservis, Kathmandu.

1054. Ay, P.; Weber, M.; Yusuf, I. 1984. On farm research shows opening for new product: Soybean and locustbean as substitutes in Ilorin Agricultural Development Project Area. IITA, Ibadan, Nigeria: Resource and Crop Management Program. 11 p. Unpublished manuscript. \* Address: International Inst. of Tropical Agriculture, Ibadan, Nigeria.

1055. **Product Name:** Mito Natto (Steamed Beans).

**Foreign Name:** Mito Nattô: Shizen Shokuhin.

**Manufacturer's Name:** Daiei Trading Co., Inc. (Importer, Distributor). Made in Japan.

**Manufacturer's Address:** Woodside, NY 11377.



**Date of Introduction:** 1984.

**Ingredients:** Soy beans, mustard.

**Wt/Vol., Packaging, Price:** 2.8 oz. (40 gm).

**New Product–Documentation:** Product with Label purchased at Diablo Oriental Foods by Akiko Shurtleff in Walnut Creek, California. Orange, pink, and black on white. 4 by 5¼ inches. On side of label in English: “How to prepare tasteful natto: After mixing up the natto well, add a measure of soy sauce and serve as it is. According to liking: (1) The Natto is more favorable [sic, favorably] served by adding measures of egg, seaweeds, mustard, welsh onion [leek]. etc. (2) In a bread diet, place natto between slices of bread and serve it as “sandwiched Natto.” (3) Natto is also used for the traditional ‘Natto Mochi’ and ‘Natto Soup.’”

1056. **Product Name:** Fresh Natto for use as Natto Starter.

**Manufacturer’s Name:** GEM Cultures.

**Manufacturer’s Address:** 30301 Sherwood Rd., Fort Bragg, CA 95437. Phone: 707-964-2922.

**Date of Introduction:** 1984.

**New Product–Documentation:** Manufacturer’s Catalog. 1984. Talk with Betty Stechmeyer of GEM Cultures. 1991. Oct. 22. This product was only on the market for about 6 months. It did not work very well.

1057. Ikeda, H.; Tsuno, S. 1984. [The componential changes during the manufacturing process of natto. I. On the amino nitrogen, carbohydrates and vitamin B-2]. *Shokumotsu Gakkaishi* 39:19-24. (Chem. Abst. 103:5183. 1985). [Jap]\*

1058. **Product Name:** [Mini Natto: Prepared Soya Beans].

**Foreign Name:** Chibbiko Nattô.

**Manufacturer’s Name:** Nishimoto Trading Co. (Exporter). Made in Japan.

**Manufacturer’s Address:** Los Angeles, California; Tokyo, Japan.

**Date of Introduction:** 1984.

**Ingredients:** Soy beans, mustard.

**Wt/Vol., Packaging, Price:** 3.17 oz. (90 gm; 30 gm x 3 pieces) in cup. Retail for \$0.69.

**How Stored:** Frozen.

**New Product–Documentation:** Product with Label purchased at an unknown location in the United States, probably Diablo Oriental Foods. But notice the red Japan Airlines (JAL) logo in the upper left of each package. 1984. Green, black, red and brown on white. 2½ by 2½ inches. Three pack, but with a different design on the front of each label. Each design contains a Japanese-style cartoon of Japanese children.

1059. **Product Name:** Shirakiku Mito Natto: Prepared Soya Beans.

**Manufacturer’s Name:** Nishimoto Trading Co. (Importer, Distributor). Made in Japan.

**Manufacturer’s Address:** 1884 East 22nd St., Los Angeles, CA 90058.

**Date of Introduction:** 1984.

**Ingredients:** 2004: Water, soy bean, mustard base (packet; mustard, vinegar, salt, citric acid, turmeric color added).

**Wt/Vol., Packaging, Price:** 3.1 oz. (90 gm) in plastic tray. Retail for \$0.99 (2004/09, Lafayette, California).

**How Stored:** Frozen.

**New Product–Documentation:** Label. 1983, undated.

Black and reddish orange on white film. (See next page).

Label sent by Martine Liquori. 2004. Sept. 22. Product subtitle is now: “Fermented soybeans.” Beans are ¼-inch diameter, medium brown, stringy, gelatinous. 1-inch flat mustard packet included. Sold as a single pack; appears to be their best-selling one. They retail for \$0.32/oz.

1060. Popoola, T.O.S.; Akueshi, C.O. 1984. Microorganisms associated with the fermentation of soybean for the production of “daddawa” (a condiment). *NIFOJ* 2&3:194. \*

• **Summary:** The authors observed that *Staphylococcus* species were present only within 24 hours of fermentation, whereas *Bacillus* species were present throughout the fermentation of soybeans to make *daddawa*.

1061. Sung, N.J.; Ji, Y.A.; Chung, S.Y. 1984. [Changes in nitrogenous compounds of soybean during fermentation].





*Journal of the Korean Society of Food and Nutrition*  
13(3):275-84. [Kor]\*

1062. Brennan, Jennifer. 1984. *The cuisines of Asia: nine great oriental cuisines by technique*. New York, NY: St. Martin's Press. ix + 542 p. Illust. (line drawings). Index. 24 cm.

• **Summary:** The “Nine great Oriental cuisines” are those of “China, India, Indonesia, Japan, Korea, Malaysia, The Philippines, Thailand, Vietnam” (as stated on the book’s cover). The book contains many recipes, yet it is largely organized into chapters by cooking techniques: barbecuing, steaming, stir-frying / using a wok, deep-frying, etc.

The chapter on “Japan” discusses soybeans, miso, tofu, and shoyu on pages 44-45. Soyfoods are said to be the 2nd largest source of protein in the Japanese diet.

The section on “Soybeans” (p. 97-104) includes a discussion of the names of various soyfoods in different Asian languages and countries. For example: “The basic bean curd is called *tau-fu* in Cantonese, *tau-hu* in Hokkien, and *tofu* in Japanese.” Or consider this (p. 99): “During the basic process of making bean curd, at the stage where the

bean and water mixture is boiled, a skin or residue forms on the top. This skin [yuba] is skimmed off and dried. It is commercially available in sheets... and in the form of sticks that bear the picturesque name of ‘second bamboo’ [dried yuba sticks] in Chinese, meaning that they are the second residue from the curd.”

There follows a 3-page table titled “Soybean products” (p. 101-03) which has four columns: Description, Chinese name [Cantonese], Japanese name, comments.

Note: Before proceeding, we believe that that the design of this table is fundamentally flawed. (1) Why are the names of the basic soyfoods not given in the other languages with which this book is concerned, including Mandarin Chinese, Korean, Indonesian, Vietnamese, Filipino, etc.? (2) Why is no English name given for each basic soyfood product? Sometimes the description is the English name, yet that name is rarely the name a person would use if they were selling the product in an English-speaking country. (3) Why are so many common “soybean products” omitted from this table, such as the various basic other types of Japanese miso and of Japanese shoyu (besides koikuchi shoyu), fermented black soybeans (douchi, dow see), soymilk, soy sprouts, roasted

soy flour, whole soy flour, soybean oil, textured vegetable protein, etc. These problems are easily solved with alternate table designs. For example, have one table for each language, with the name of each soyfood product given first in English and then in the language of that country. Put the description and comments in a glossary to avoid repetition. Or, have a glossary entry for each soyfood, with the English name, description, comments.

The table is divided into four basic types of soybean products. After each, we will give the Cantonese name and then the Japanese name, and we will indicate disagreements using [sic]. NL = Not listed.

(1) Bean curd: Tau fu fu [sic] = kinugoshi tofu. Tau fu = momen tofu. NL = yaki tofu [sic, yaki-dofu]. NL = koya tofu or kori tofu [sic, koya-dofu or kori-dofu]. Tau fu pok = abura age. Fu chu = yuba [sic, fu chu is dried yuba sticks. Yuba in Mandarin is doufu pi]. fu joke [sic, fu jook] (bean curd sticks) = NL. Tim joke [sic, tiem jook] (sweet bean curd sticks) = NL. tau fu kon [Mandarin: doufu gan; pressed tofu].

(2) Soy sauce: Light = chan ch'an or sang chu = usu kuchi shoyu [sic, not the same]. Dark, medium = see yu chan yan = shoyu [sic, see yu is soy nugget sauce, not made in Japan. Japanese shoyu is not traditionally made in China]. Dark, heavy, sweet = chu yan = NL.

(3) Fermented bean pastes and cheeses. Black bean paste = dau see tau ch'ih = NL. Sweet, white bean paste = NL = shiro miso. White soy cheese [fermented tofu, should be classified under tofu] = pai doufu-ru or foo yee or foo yu = NL. Red soybean paste = NL = aka miso. Red soy cheese or spiced red bean curd = hung doufu-ru or nom yee or nam yu.

(3) Miscellaneous soybean productions. Soy jam = yun shi jeung = NL. Whole fermented soybeans = NL = nato [sic, natto]. Red bean sauce = saang see jeung = NL. Soybeans and malted rice = NL = moromi miso. Hoisin sauce = hoisin = NL.

In the "Basic recipes" section is a recipe for Indonesian dark sweet soy sauce (*ketjap manis*).

The Glossary (p. 499-515) contains the following soy-related entries: "Bean Curd (*tofu*, Japanese; *tao foo*, Chinese; *tahu*, Indonesian and Thai; *tokwa*, Philippines): A curdled, soft, cheeselike preparation made from soybean milk. Used as a source of protein in Asian cooking. Available loose or in packages."

Bean paste, red sweet [from azuki beans]. "Substitute Chinese sweet red bean paste, p. 132."

Bean paste, yellow (Chinese).

"Beans, black salted fermented. (Called dow see in Chinese) These are very salty soybeans, sold in cans in Chinese markets. Used with garlic as a flavoring for fish and pork dishes. substitute: Soybeans, cooked until soft and seasoned with plenty of soy sauce."

Bean sprouts: Usually refers to mung bean sprouts, "although alfalfa and soybean sprouts are also used."

Hoisin sauce: Soybeans are a major ingredient, along

with garlic, chili peppers, and various other spices and ingredients.

Miso. Oyster sauce: "A Chinese sauce, made from oysters cooked in soy sauce and brine." Used as a seasoning with cooked foods and as a table sauce. See recipe p. 146.

Red bean sauce: "A strong table sauce made from mashed soybeans." Available in cans from Chinese stores.

Soy sauce

Also contains entries for: Kombu. Monosodium glutamate (MSG; "I do not use it nor do I recommend its use"). Mung beans.

The index contains 28 entries for soybean, 22 for soy sauce, 14 for miso, 6 for bean paste, oyster sauce, teriyaki, 4 for bean curd—deep fried, hoisin sauce, vegetarian dishes, 2 for ketjap, and 1 each for beans—black salted fermented, bean curd—fermented, jam—soy, jang (see miso), milk—soybean, ragi, shoyu (see soy sauce), soybean oil, sukuyaki, tahu, tau-fu or tau-hu (see bean curd), tempe [tempeh], textured vegetable protein (TVP), tofu (see bean curd), tou shih [soy nuggets].

About the author (from the rear cover): "Jennifer Brennan grew up in Pakistan and India and has spent many years in Southeast Asia. She is the author of *The Original Thai Cookbook*." She is "Winner of the IACP [International Association of Culinary Professionals] Award for the Best Literary Food Writing."

1063. GEM Cultures. 1984. Food cultures from around the world / and more [Mail order catalog]. 30301 Sherwood Rd., Fort Bragg, CA 95437. 4 p. [4 ref]

• **Summary:** Contents: 1. Powdered cultures for soycrafters: Powdered starter cultures for tempeh, miso, amazake, shoyu, and tamari. In home and commercial sizes. Rice koji. 2. Koji starter kits. 2. Fresh self-renewing cultures: Viili starter, sourdough starter, kefir grains, natto starter, living tempeh starter. 3. Coagulants for tofu making (nigari, Terra Alba calcium sulfate in 1 lb or 5 lb bags).

4. Some helpful books. 5. Sea vegetables from the Mendocino Sea Vegetable Co. Our purpose. How to order. Address: Fort Bragg, California. Phone: 707-964-2922.

1064. Kagaku Gijutsu-cho, Shigen Chosa-kai (Science & Technology Bureau). 1984. Shitei shokuhin seibun hyô [Standard tables of food composition in Japan. 4th ed.]. Tokyo. 370 p. Introduction by R. Kagawa, Joshi Eiyo Daigaku. 28 cm. [Jap; Eng]

• **Summary:** Pages 76-80 gives a nutritional analysis of the following Japanese soyfoods: Soybeans: whole domestic (dry, or boiled), USA whole dry, Chinese whole dry. Green immature: raw, or boiled. Soybean sprouts: raw, or boiled. Defatted soybeans: whole, or dehulled. Kinako (roasted, ground soybeans). Budô-mame. Tofu: regular (momen), silken (kinugoshi), soft, packed, Okinawa tofu, grilled (yaki-dofu), nama-agé (deep-fried tofu cutlets), abura-agé (deep-

fried tofu pouches), ganmodoki, kori-dofu, Tofu chikuwa (steamed, or roasted). Natto: Itohiki natto, goto-natto, tera-natto (fermented black soybeans). Miso: Rice koji miso (ama miso, light yellow miso, dark yellow miso), barley koji miso, soybean koji miso, dried miso, kinzanji miso, hishio miso. Okara. Soymilk: regular, reconstituted, soft drinks. Yuba: Fresh, or dried.

Page 254 gives the amino acid composition of soybeans, tofu, dried frozen tofu, yuba, okara, natto, and 3 types of miso. Address: Japan.

1065. Marukin Shokuhin: Nattô tabete, genki naru [Marukin Shokuhin: Eat natto and become healthy]. 1984. Kumamoto, Japan: Marukin. 10 p. 26 cm. [Jap; eng+]  
 • **Summary:** A solid but colorful introduction to Marukin Foods. Address: Kumamoto-shi, Japan. Phone: 096-325-3232.

1066. Saito, Akio. 1984. [Chronology of soybeans in Japan, 1970 to 1984] (Document part). In: Akio Saito. 1985. Daizu Geppo (Soybean Monthly News). Feb. p. 16-18. [Jap]  
 • **Summary:** 1970–Soybean cultivation area in Japan drops to 95,500 ha, falling below 100,000 ha for the first time. Soybean cultivation area in Japan is nearly 10% of total cultivation area for all crops.

1970–Soybean imports rise to 3,243,790 tonnes, passing 3 million tonnes for the first time.

1972–Production of defatted soybean meal reaches 2,035,000 tonnes, topping 2 million tonnes for the first time. Production has risen 2.8 fold during the past decade.

1972–Production of deep-fried tofu pouches (*aburage*) reaches 200,000 tonnes.

1973–Soybean imports reach 3,635,000 tonnes, up 7% over last year despite U.S. export regulations.

1973–Some 2,740,000 tonnes of soybeans, representing about 80% of all soybeans in Japan, are crushed to make soy oil. 1973 Jan. 27–An extraordinary Cabinet meeting is held and the decision is made to import soybeans from the USA urgently. The price of soybeans in late 1972 was 3,000 yen per 60 kg sack but now it has become very difficult to get them even if you pay 15,000 yen per 60 kg. Soybeans are called “yellow diamonds.”

1973 June 27–President Richard Nixon sets new regulations for U.S. soybean exports. These give the Japanese tofu, miso, and soy oil industries a big “shock.”

1973 July 6–The Japanese government passes a new law that forbids soybean brokers or sellers in Japan from buying up and selling at inflated prices 16 important items—including soybeans.

1973 July 12–The Japanese Department of Commerce announces that it permits the export of soybeans for special food uses, such as tofu and high-quality misos, which were planted under previous contracts.

1973 Sept. 7–The U.S. Department of Agriculture

removes all regulations that concern exports of agricultural products.

1973 Oct. 17–OPEC nations decide to regulate the production and supply of crude petroleum. This leads to huge price increases in petroleum products—known in Japan as the “oil shock.” Japanese buy up toilet paper and wash detergents causing much confusion.

1974–Good quality miso now retails on average for 251 yen/kg, up 22.4% from last year. The average retail price of shoyu in Tokyo is 434 yen for 3 liters, up 33.5% from last year.

1974 Feb.–The Japanese Ministry of Agriculture and Forestry asks manufacturers of tofu, natto, deep-fried tofu pouches, and dried-frozen tofu to reduce the retail prices of their products to the levels they were at in November 1973.

1974 July 30–In order to get rid of AF2 (a preservative widely used in tofu), the City of Tokyo decides to make a public announcement of all foods which may contain AF2 and announces that food inspections will start immediately, on August 1.

1974 Aug.–The Japanese Ministry of Public Welfare forbids the usage of AF2.

1974 Oct.–The JAS food certification system, formerly applied to widely distributed foods, is applied to tofu, natto, konnyaku, etc., which are foods that are distributed over a small area.

1975–The typical price of Tofu in Tokyo is 60-70 yen per 300 gm. Yet in supermarkets it averages 50 yen, and some sell it for as little as 25 yen.

1976–Soybean production in Japan drops to 109,500 tonnes, the lowest level since 1878 when production statistics started to be recorded.

1978–The soybean cultivation area reaches 127,000 ha, topping 100,000 ha for the first time in 9 years.

1978–Soybean imports rise to 4,260,000 tonnes, topping 4 million tonnes for the first time. This is 4.5 times as much soybean imports as 20 years ago.

1978 Aug.–Unbranded generic foods, such as shoyu, miso, and salad oil, start to be sold. They retail for about 30% less than major branded products.

1979–Tofu production continues to rise, reaching 1,114,000 tonnes, an topping 1.1 million tonnes for the first time.

1980–Production of natto reaches 153,000 tonnes, up 33% compared with 10 years ago (when it was 115,000 tonnes).

1981–The area occupied by registered soybean varieties rises to more than 60% of total soybean area.

1981 Per capita consumption of miso drops below 6 kg/year to 5.9 kg/year, down 30% compared with 20 years ago (when it was 8.4 kg) This is a reflection of the health food movement in Japan.

1981 Sept.–Dr. Hirayama of the National Cancer Center announces that miso soup has some effect on lowering the

death rate from stomach cancer, stroke, and sclerosis of the liver.

1981 Nov.—The Ministry of Agriculture and Forestry announces JAS (Japanese Agricultural Standards) for soymilk. The soymilk boom starts. The total yen value of the soymilk by all major Japanese manufacturers is 5,000 million yen.

1982—There are now 77 registered varieties of soybeans cultivated in Japan. Two of these (Norin 1-go and Norin 5-go) have a Norin [Ministry of Agriculture] number, and 25 have various place names.

1982—Production of soybeans in Japan this year is 226,300 tonnes, and soybean imports are 4,344,000 tonnes—which is only 5% self sufficiency.

1982—Per capita consumption of soy oil rises to 5.1 kg, topping 5 kg for the first time. It is 3 times higher than it was 3 years ago.

1982—Production of defatted soybean meal reaches 2,800,000 tonnes—up 38% over the last 10 years.

1983—Production of soymilk in Japan rises to 116,724 tonnes, topping 100,000 tonnes for the first time. It has risen 71% during the past year.

1983—Per capita consumption of soybeans in Japan is 5.8 kg, up 3.6% during the past year.

1984—The use of soymilk as a beverage is declining in Japan. The movement to use more soymilk as an ingredient in foods (such as noodles, breads, ice creams, and creamy soups) is becoming more active.

1984—Soybean yields in Japan reach 1,770 kg/ha, an all-time record. The old record was 1,540 kg/ha in 1982. Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

1067. Sharpe, Dennis B. 1984. Project 2002: Planning the future of soybeans. St. Louis, Missouri: American Soybean Assoc. iv + 78 p. 27 cm.

• **Summary:** This report is a joint project of the American Soybean Association and the Elanco Products Company. Contents: Preface. Introduction. Key issues identified. Synopsis of results and recommendations. Blue ribbon panel members (20 men). Advisory panel members (21 men). Demand, production & acreage projections. Project 2002 survey results: Economic survey, soybean yield survey, soil erosion policy survey, genetic engineering survey, soy protein market potential survey. Assessment of major competition. Appendix I—Project 2002 survey respondents: Economic survey, soybean yield survey, soil erosion policy, soy protein market potential survey (24 people), genetic engineering survey. Appendix II—Genetic engineering glossary of terms: Biotechnology, callus, cell fusion, chromosomes, cultivar, DNA (deoxyribonucleic acid), DNA vector, enzyme, gene, gene expression, genetic code, genetic engineering, gene mapping, genome, germ cell, hybrid, in vitro, meristem, mutants, mutation, phenotype, plasmid,

protein, protoplast, protoplast fusion, recombinant DNA, RNA (ribonucleic acid), somatic cell, tissue culture, vector.

Pages 50-54 give a very interesting “Soy Protein Market Potential Survey.” This survey polled leaders in the U.S. processing and research area. The results indicated “the market for U.S.-produced edible soy protein should rise to nearly 1,900 million pounds (50% flour equivalent) by the year 2002. This is nearly a three fold increase from the estimated 650 million pounds produced in 1982. While this represents a large increase, it is considerably more conservative than estimates made in the mid-1970s.

“The fastest growing segment of the edible soy protein market is soy isolate. Isolate production was projected to grow at a 7% compound annual rate versus 4.5% for soy flour and 5.4% for all products combined.” Specifically, soy flour was projected to grow from an estimated 400 million lb in 1982 to 958 million lb in 2002, a compound annual growth rate of 4.5%. Soy protein concentrate was projected to grow from an estimated 80 million lb in 1982 to 251 million lb in 2002, a compound annual growth rate of 5.9%. Note: Three respondents estimated the 1982 concentrate figure to be 100 million lb and two others estimated 90 million lb.

Soy protein isolate was projected to grow from an estimated 80 million lb in 1982 to 308 million lb in 2002, a compound annual growth rate of 7.0%. Note: Two respondents estimated the 1982 isolate figure to be 100 million lb, and three others estimated 110 million, 75 million, and 50 million lb respectively. Pet foods and specialty feeds (such as calf milk replacers) were projected to grow from an estimated 1,500 million lb in 1982 to 2752 million lb in 2002, a compound annual growth rate of 3.1%. Note: Several respondents estimated the 1982 figure to be 500-700 million lb, and one respondent estimated it to be only 200 million lb.

“The pet food and specialty feeds market is the single largest market for soy protein other than bulk soybean meal for livestock and poultry. Some of the respondents took major exception to the 1982 estimate of 1,500 million pounds of soy protein utilized in pet foods and specialty feeds. In fact one respondent cut the estimate to only 200 million pounds. The 1,500 million pound estimate was derived from data based on the Selling Areas Market [Marketing], Inc. (SAMI) report of pet food tonnage that assumed an average protein content of 24% with 35% of the protein provided by soy ingredients. The SAMI figures were factored up 10% to allow for sales by rural feed stores and sales direct to kennels. The disparity in pet food estimates of actual sales highlights what seems to be a considerable amount of uncertainty about the actual size of the soy protein market, exclusive of bulk soybean meal.

“While growth rates for food and pet food use of soy protein are impressive, the total volume is expected to remain only a small fraction of projected U.S. soybean production—about 3% of the same as 1982. The greatest

potential was seen for soy milk, imitation cheeses, ground meat blends and extenders, and commercial bakery or confectionery ingredients.

“Increased health consciousness in the general population, improved palatability of soy foods and higher meat prices were seen as the keys to increasing demand for meat, dairy and bakery uses of soy protein.” Address: 2002 Project Manager, American Soybean Assoc., St. Louis, Missouri.

1068. Soybeans and soybean products. Quick & easy nutritious Japanese cooking no. 1. 1984. Chiyoda-ku, Tokyo: Joie, Inc. 116 p. Illust. No index. 27 cm.

• **Summary:** A beautiful cookbook, in which every recipe is illustrated with a color photo. Contents: Preparation tips. Metric tables. Soybeans with meat. Soybeans with eggs. Soybeans with fish. Soybeans with vegetables. Soybeans with seaweed. Yuba. Unohana [okara]. Natto. Koya-dofu. Ganmodoki. Aburage. Atsuage. Grilled tofu. Tofu salads. Deep-fried tofu. Tofu with oysters or kelp. Tofu with shrimps. Tofu with fish. Tofu with meat. Tofu with vegetables. Tofu soups. Tofu. Preparatory techniques for tofu. Information: Glossary, basic recipes.

Note: The publisher is also listed as Japan Publications, Inc. Address: Joie, 1-8-3 Hirakawa-cho, Chiyoda-ku, Tokyo 102, Japan.

1069. Fukushima, Danji. 1985. Fermented vegetable protein and related foods of Japan and China. *Food Reviews International* 1(1):149-209. [99 ref]

• **Summary:** Introduction. Historical aspects of soy sauce and miso. General description of fermented vegetable protein foods: Soy sauce (varieties, manufacturing, flavor components and quality evaluation), miso, natto, sufu (fermented product of tofu), fermented soy milk. Microbiology, biochemistry and nutrition: Role of koji as enzyme source (unique sources of enzymes, peptidases in koji, role of proteinases and peptidases in koji during protein digestion, role of glutaminase in koji in formation of glutamic acid during protein digestion), effect of heat treatment of soybean proteins on their digestibility and nutritive value (enzyme digestibility and yield of soy sauce, enzyme digestibility and nutritive value of protein), basic mechanisms for protein coagulation, microorganisms during brine fermentation in soy sauce and miso (change of microflora during brine fermentation, properties of *P. halophilus*, properties of *S. rouxii*, properties of *Torulopsis* species), nutritive value, safety and anticarcinogenicity of fermented foods. Future of traditional vegetable protein foods made through fermentation. References. Address: Food Science Research Lab., Kikkoman Corp., Noda-shi, Chiba-ken, Japan.

1070. Oyekan, Peter; Navasero, Evelyn; Omueti, Olusola.

1985. Current status of soybean research, production, and utilization in Nigeria. In: 1985. Sri Lanka Soybean Utilization Training Program and Workshop: Proceedings. See p. 459.

• **Summary:** “Soybean was introduced to Nigeria about 1908 and it was cultivated for many years as an export crop in a small area in Benue State where the introduced variety ‘Malayan’ was adopted. The crop is usually grown in small holdings in mixed cropping with sorghum or maize or as an intercrop in citrus orchards... active soybean research programs that were started in the 1960s at four agricultural research institutes with Nigeria have produced soybean varieties with inherently better storability as well as ability to nodulate without prior inoculation with prepared Rhizobium. These improved varieties yield between 1.5–2.0 tonnes/ha as against about 1.8 tonnes/ha from the local variety ‘Malayan’...”

“The improved varieties are also adapted to a wider area of the country, making it now possible to grow soybean commercially in 12 of the 19 states of the country instead of only one. This development has led to increased soybean production estimated at 75,000–80,000 tonnes in 1984.

“At present all the soybean produced in Nigeria is consumed locally. The bulk of the current production is used in making ‘Dawadawa’ a fermented soybean produce used in flavouring Nigerian soups.”

“The Federal Government of Nigeria has recently adopted soybean as one of the crops that is being given priority. The Federal Government is currently funding some aspects of soybean research.”

Note: This is the earliest English-language document seen (Jan. 2012) that contains the term “Dawadawa” (unhyphenated) in connection with soybeans; it is a close relative of natto. Address: Nigeria.

1071. Saito, Akio. 1985. Daizu bunka-shi nenpyô [Chronology of soybeans, 122 B.C. to 1984]. *Daizu Geppo* (*Soybean Monthly News*). Jan. p. 12-16; Feb. p. 10-18. 28 cm. [Jap; eng+]

• **Summary:** This very interesting, well-researched, and detailed chronology, which is full of new information, focuses on the development of soybeans and soyfoods in Japan. We have divided the contents of the chronology into 9 separate records; the date of each corresponds to the last year in that part of the chronology: 1292, 1599, 1699, 1868, 1899, 1926, 1949, 1969, and 1984. Address: Norin Suisansho, Tokei Johobu, Norin Tokeika Kacho Hosa.

1072. Hatsuhana. 1985. Hasuhana (Ad). *New York Times*. Feb. 10. p. 735.

• **Summary:** A half-page ad for this Japanese restaurant at 17 East 48th St. Most of the ad is devoted to the menu, which is divided into appetizers and entrees. Appetizers include: “Soy bean [miso] soup. Geso yaki, broiled squid feet with butter,



salt or soy bean paste / miso. Hiya yakko, cold soy bean curd [tofu]. Oshitashi [O-shitashi, O-hitashi], spinach prepared in a delicate sesame and soy sauce. Toro natto, chopped fatty tuna with aged soy beans in a cup.

Many of the entrees are nori-wrapped sushi.

1073. *Toyo Shinpo (Soyfoods News)*. 1985. Wara ga te ni hairazu... Pinchi no Mito nattô [Rice straw is hard to get... Mito natto is having a hard time]. Feb. 21. p. 9. [Jap; eng+] Address: Kyoto, Japan.

1074. Odunfa, S.A.; Adewuyi, E.Y. 1985. Optimization of process conditions for the fermentation of African locust bean (*Parkia biglobosa*). I. Effect of time, temperature and humidity. *Chemie, Mikrobiologie, Technologie der Lebensmittel* 9(1):6-10. Feb. [12 ref]

• **Summary:** Describes the preparation of *iru* (also known as dawadawa) and indicates that some Nigerian families serve the fermented bean as a low cost meat substitute due to its high protein content (29%). A comparison of the locust bean fermentation with various soybean fermentations (natto and thua-nao are both fermented with *Bacillus subtilis* at similar optimum fermentation temperatures) is given at the end of the article.

A flow sheet shows the traditional process using locust beans. Salt is added at the end as a preservative. The resulting product is "Sticky, dark brown strong smelling beans with a greyish outer layer." Address: Dep. of Botany, Univ. of Ibadan, Ibadan, Nigeria.

1075. Sugawara, Etsuko; Ito, T.; Odagiri, S.; Kubota, K.; Kobayashi, K. 1985. Comparison of compositions of odor components of natto and cooked soybeans. *Agricultural and Biological Chemistry* 49(2):311-17. Feb. [22 ref]

• **Summary:** The authors found nine alkylpyrazines including tetramethylpyrazine in natto at a total level of 24.07 mg/kg. The pyrazines were detected only after the cooked soybeans were inoculated with the natto bacterium, *Bacillus natto*. No beany odor was detected for natto. The authors concluded that pyrazines and sulfur-containing compounds were important contributors to the characteristic odor of natto, and that they may mask the beany odor. Address: 1. Iwate Prefectural Morioka Junior College, Sumiyoshi, Morioka 020, Japan; 2. Dep. of Agricultural Chemistry, Iwate Univ., Ueda, Morioka 020, Japan; 3. Lab. of Food Chemistry, Ochanomizu Univ., Bunkyo-ku, Tokyo, 112 Japan.

1076. Miller, Bryan. 1985. Restaurants: Sushi and tempura on Park Avenue. *New York Times*. March 8. p. C20.

• **Summary:** This is a review of Mitsukoshi, a Japanese restaurant at 465 Park Ave. (at 57th St.). The waitress saved the writer from embarrassment in front of friends. In a foolhardy show of bravado, he ordered something called natto sengyo ae, having no idea what it was.

"Maybe you not like fish guts so much?" she warned discreetly." He left her a large tip.

The word "tofu" appears several times in the review, without its translation "bean curd."

1077. Tokai, Akinori. 1985. Nebari mo nioi mo nai nattô: Tenpe [The natto that has neither stickiness nor smell: Tempeh]. *Yomiuri Shinbun (Yomiuri Daily News, Tokyo, Evening ed.)*. March 19. p. 3. [Jap]

• **Summary:** A photo shows trays of tempeh being made by a Marusan worker. Address: Japan.

1078. Byrne, Maureen. 1985. The future for soyfoods. The first European Soyfoods Workshop was held in Amsterdam by the American Soybean Association, and papers covered subjects from marketing to microbiological standards. *Food Manufacture (London)* 60(3):49, 51, 53. March.

• **Summary:** This workshop was held on 27-28 Sept. 1984 at the Krasnapolski Hotel, Amsterdam, the Netherlands—organized by the American Soybean Association. Gives a brief summary of each paper presented.

Contains an interesting full-page table (p. 51) in which Oriental soyfoods are classified into two types: Non-fermented and fermented. For each non-fermented food is given the local names, description, and uses. The non-fermented soyfoods are: Fresh green soybeans, soybean sprouts (huang tou ya, Chinese), soynuts (hueh huang tou, Chinese; iri-mame, Japanese), soymilk (tou chiang or tounai, Chinese; tonyu, Japanese; kongkuk, Korean), soy flour (huang tou fen, Chinese), soy protein-lipid film (yuba, tou-fu-pi), soybean curd (tofu).

For each fermented soyfood is given the local names, organisms used, description, and uses.

The fermented soyfoods are: Soy sauce, miso, tempeh, natto, fermented tofu, and fermented black soybeans.

Soy sauce includes chiang-yu from China, shoyu from Japan, ketjap from Indonesia, kanjang from Korea, toyo and see-ieu from Southeast Asia.

Fermented black soybeans include tau-shih from China, tao-si from the Philippines, tau-cheo from Malaysia, taucu from Indonesia, and Hamanatto from Japan.

1079. Nabetani, Hiroshi; Watanabe, Atsuo; Horikita, Horiyuki. 1985. [Energy consumption for waste and waste water treatment in food processing. III. Natto (fermented soy bean) processing]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 46. p. 73-77. March. [1 ref. Jap; eng]

Address: National Food Research Inst. (Shokuhin Sogo Kenkyujo), Ministry of Agriculture, Forestry and Fisheries, Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan.

1080. Stechmeyer, Betty. 1985. Re: Thanks for book. New

developments. Letter to William Shurtleff at Soyfoods Center, April 11. 1 p. Typed, with signature on letterhead. [2 ref]

• **Summary:** “Thanks so much for the new edition *Book of Tempeh*... Things are quiet here. Gordon is teaching microbiology at College of the Redwoods and we hope to teach the Soyfoods Workshop next semester. Penny Billiter of Star Soyfoods, Sandpoint, Idaho, was our student. Before the Workshop she hadn’t even heard of tempeh, just tofu. She came over just before leaving town to spend a day of intense note taking and talking and a month later was selling tofu pudding to Safeway!

“I’ve enclosed our most recent catalog. Since we have 20+ of the first *Book of Tempeh* we’ll keep with it for now.

“I’m now selling tempeh on a special order basis to local restaurants. Koji, rice and barley, goes to coops on the same basis. I even had a special order for natto!

“Hope all is well with you. You’ve obviously been very busy as always! Best regards,...” Address: GEM Cultures, 30301 Sherwood Rd., Fort Bragg, California 95437. Phone: 707-964-2922.

1081. *American Type Culture Collection Quarterly Newsletter*. 1985. Fermented black beans—Important ingredient in Chinese cooking. April. p. 9. [2 ref]

• **Summary:** Gives a recipe for making Hamanatto using whole black beans [presumably soybeans] and *Aspergillus oryzae*. “Hamanatto, which resembles raisins in appearance, is much more palatable to people from Western countries [than itohiki natto]. It is also sometimes referred to as dowsi, taosi, or dou shih.” Yukiwari-natto is made using both *Aspergillus oryzae* (in a rice koji) and *Bacillus subtilis*.

Note: This is the earliest English-language document seen (Nov. 2011) that uses the word *dowsi* to refer to “fermented black soybeans.”

1082. Shurtleff, William; Aoyagi, Akiko. 1985. Soyfoods industry and market: Directory and databook 1985. 5th ed. Lafayette, California: Soyfoods Center. 220 p. Index. April. 28 cm. Updated every 1-3 years with a bibliographic supplement. [360 ref]

• **Summary:** Contents: 1. Introduction. 2. Directory of soyfoods manufacturers. 3. Directory of soyfoods support industry: Goods & services. 4. The many types of soyfoods. 5. Historical: Historically most important books and serials, earliest references to individual soyfoods. 6. Year in review. 7. Soyfoods industry and market in the U.S. 8. Tofu industry and market in the U.S. and Canada. 9. Soymilk industry and market: Worldwide and in the U.S. 10. Tempeh industry and market in the U.S. 11. Soy sauce industry and market in the U.S. and Japan. 12. Miso industry and market in the U.S. and Japan. 13. Soynut industry and market in the U.S. 14. Natto industry and market in Japan. 15. Statistics on fermented soyfoods in East Asia. 16. Soyfoods in restaurants, delis &

cafeterias. 17. Soybean crushing industry in the U.S. 18. Soy oil industry and market in the U.S. 19. Soy flour and cereal-soy blends industry and market worldwide. 20. Modern soy protein products industry and market in the U.S. 21. Soyfoods terminology and standards. 22. Names of soyfoods in major foreign languages (incl. Chinese / pinyin; Hoisin sauce = haixian jiang). 23. Soybean production worldwide and country-by-country. 24. Key institutions working with soyfoods worldwide. 25. Measures, weights, and equivalents. 26. About the Soyfoods Center & soyfoods consulting services. 27. Bibliography.

In February 1977 a Gallup poll in America showed a remarkable shift in the public’s awareness of and attitudes toward soyfoods. The sampling of 1,543 adults across the nation found that: 33% believe that soybeans will be the most important source of protein in the future—ahead of fish at 24% and meat at 21%. 55% believe that “soy products have a nutritional value equal or superior to that of meat.” 54% reported that they “had eaten foods containing soy protein as a prime ingredient within the past 12 months.” Younger age groups living in large cities and those with college or university educations had the most favorable attitudes toward soy protein, indicating that support for soyfoods is likely to grow in the future. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

1083. Karki, Tika. 1985. Re: Kinema in Nepal. Letter to William Shurtleff at Soyfoods Center, May 20. 1 p. Typed, with signature on letterhead.

• **Summary:** “Kinema’ is a soybean fermented product popularly consumed by the Kirat ethnic group of Nepal. They are inhabitants of the eastern hills. Kinema is also popular in Darjeeling (Nepal), as well as in neighboring Sikkim and Bhutan. The method of preparation and consumption pattern are very similar.

“At the moment I am working on ‘Microbiology of kinema.’ I will send you the report as soon as it is ready. We are also studying the Kinema of Darjeeling. Our preliminary investigation indicates that there is a close resemblance between tuanao [of Thailand] and Kinema. In Nepal, Kinema is consumed in the form of vegetable soup either singly or mixed with other green leafy vegetables. A typical flow diagram for making Kinema is attached.

It shows: Washing soybeans. Soaking overnight. Boiling. Cracking (by wooden pestle & mortar and adding a little ash). Packing (in bamboo basket known as *Dalo* in Nepali, surrounded and covered by banana leaves). Fermentation (24 hours). Drying in the sun. Kinema. Stored.

Note: This is the earliest English-language document seen (Jan. 2012) that uses the term “tuanao” (one word) to refer to thua-nao. Address: Central Food Research Lab., Quality Control and Standardization Div., Ministry of Agriculture, Babar Mahal, Kathmandu, Nepal. Phone: 12781.

1084. Aoki, Sadao. 1985. Nattô oyobi tenpe no seizô ni tsuite [Natto and tempeh production]. *Daizu Geppo (Soybean Monthly News)*. June. p. 10-18. [Jap]

Address: Hakko Shokuhin Bucho, Tochigi-ken Shokuhin Kogyo Shidosho.

1085. Kushi, Aveline; Jack, Alex. 1985. Aveline Kushi's complete guide to macrobiotic cooking: For health, harmony, and peace. New York, NY: Warner Books. xvii + 414 p. June. Illust. Index. 23 cm. [36 ref]

• **Summary:** Index entries include: Miso 61, Tofu 50, Tamari 19, Tempeh 17, Whole dry soybeans 6, Natto 3, Soymilk 3, Yuba 1. This book calls ganmodoki "Tofu Croquettes" and further states that "*Gan* means 'crane' and *modoki* means 'looks like.'" Among the 31 chapters are ones titled Beans (incl. basic black soybeans, and brown rice with black soybeans); Tofu, Tempeh, and Natto (including yuba); Sea Vegetables; Condiments and Garnishes (incl. miso), and Fish and Seafood.

Under "Black Soybeans" (p. 257) we read: "These nice shiny beans are also called Japanese black beans. They have a strong, delicious taste. Their juice is said to make the voice clear and beautiful. Throughout Japan, mothers prepare their children for music tests and singing lessons with this dish. Black soybeans are also used medicinally to help discharge animal toxins from the body." Note: This is the earliest macrobiotic cookbook seen that uses the term "Black soybeans" in a recipe title. All previous macrobiotic cookbooks called them "Black beans."

Contains recipes for homemade tofu, tempeh, and natto. Address: Brookline, Massachusetts.

1086. Tsujimura, Katsura. 1985. Re: Thinking about tempeh, salted koji, and natto. Letter to William Shurtleff at Soyfoods Center, June 12. 2 p. Typed, with signature. [Eng]

• **Summary:** He thanks Mr. and Mrs. Shurtleff for their present of the new edition of 'The Book of Tempeh,' and makes a few observations about the symposium "Non-Salted Soybean Fermentation" to be held July 15-18 at Tsukuba Science City.

He is interested in understanding the connection between the microorganisms of kinema, thua-nao, natto, and onchom merah of Indonesia (*Neurospora*).

"You have mentioned a food named 'Tou Chiah Ping (soy bean fried cake),' reported and photographed at Beijing [China] in 1931. (p. 155)" Is its Chinese characters [three handwritten characters]?

"Unfortunately you could not get new information by asking 10 Chinese. None of them knew about it. This means that the food was lost or was eaten only by lower classes.

"You have referred to the relation of tou ching ping and tempe. I also imagine tou-chiah-ping was one of the original types of the consumption of soybean-koji, before it was

used for enzyme reaction, as in the case of miso production. Salted koji (in Japan it is known variously as Tera-natto, Daitokuji-natto, Hama-natto or Shiokara-natto) is another type of consumption. It improves preservation and serves as an appetizer of boiled rice. From it miso and soya sauce were developed.

"At present grain-koji (made of rice or wheat) is usually used for miso and soya-sauce production. Soybean protein is hydrolyzed by grain-koji. Grain-koji itself is never eaten directly. It is also used as enzyme preparation to hydrolyze starch to make 'Amasake' or as the raw material for 'Sake' making. Whether grain-koji was eaten in ancient time or not, I have no information.

"Natto and 'Oncom merah' are unique products utilizing *Bacillus* and *Neurospora* respectively. I suppose both might developed from failed production of molding.

"There are two kinds of onchom, black onchom and red onchom; the former is made using *Rhizopus*, and is the analogue of tempeh. You have classified this as a type of tempe..."

"Natto resulted from the failure of soybean-koji production, I suppose. Natto developed in northeast Japan, where the climate was cooler than in southeast. One must maintain warm temperature to grow *Aspergillus* to get koji. So they packed the cooked soybean in the straw parcel, and this resulted in the growth of *Bacillus* instead of *Aspergillus*. The wet condition on the surface of boiled soybean may benefit to the *Bacillus* (unfortunately I have no experimental evidence).

"I am interested that the process of the development of natto and onchom (red onchom), which seem to be resemble each other. Sincerely yours,..." Address: Prof. of Nutrition, Higashi Nakano 2-5-5, Nakano-ku, Tokyo 164, Japan.

1087. *Asahi Shinbun (Asahi Daily News, Tokyo)*. 1985.

"Mirai shoku"—nattô: Tsukuba de kokusai shinpojiumu [Food of the future—Natto: International symposium in Tsukuba]. July 13. [Jap]

• **Summary:** While focusing on the international symposium on non-salted fermented soybean foods, held in Tsukuba, Japan, this article discusses tempeh as a type of natto. A map shows the natto triangle—including kinema, thua nao, and tempeh—passing through Japan, Nepal, Thailand, and Indonesia. Address: Japan.

1088. *Mainichi Shinbun*. 1985. Kaze no uta: Nattô kanpa [Song of the wind: Natto donations]. July 16. [Jap]

• **Summary:** *Kanpa* refers to a movement to encourage the public—in this case soliciting donations for natto in Japan.

1089. *Toyo Shinpo (Soyfoods News)*. 1985. '85 Ajia "muen Hakko Daizu" Kaigi 7/15-16 oite Tsukuba Kenkyû Gakuen Tosh Kôryû Sentaa [1985 No-Salt Fermented Soybean Conference, July 15-16 at Tsukuba Research Center]. July

21. p. 9. [Jap; eng+]

• **Summary:** Representatives from 15 overseas countries attended. Natto and tempeh's "International Symposium" opens. 350 people attended; they had active discussions. Thua-nao (*chuana*) from Thailand was discussed.

1090. *Toyo Shinpo (Soyfoods News)*. 1985. Nyûjô kyaku 5,000 nin ni apuroochi [Nearly 5,000 people attended]. July 21. p. 8. [Jap; eng+]

• **Summary:** About the 1985 No-Salt Fermented Soybean Conference, July 15-16 at Tsukuba Research Center. Natto products were exhibited at a vegetable protein fair. It was sponsored by the Dep. of Agriculture and Forestry (*Nôsuisho*), from Aug. 26 to Sept. 7 at their building. Vegetable protein is a basic part of our daily life. At that time the Japanese Natto Association introduced tempeh, and they took a poll of 140 people. 4.9% of women were aware of tempeh. Mr. Kanasugi introduced tempeh foods to people. Samples of tekka miso, croquettes, fried tempeh, and tempeh burger were served. People like the flavor of these.

1091. *Yomiuri Shinbun (Yomiuri Daily News, Tokyo, Evening ed.)*. 1985. "Nattô"—sekai ni shinshutsu ["Natto" is spreading out across the world]. July 24. [Jap]

• **Summary:** About the international symposium on non-salted fermented soybean foods held in Tsukuba, Japan. Discusses tempeh as well as natto. Photos show: (1) A man making tempeh in Indonesia. (2) A Japanese woman holding a plate of tempeh snacks. Address: Japan.

1092. Asian Symposium on Non-Salted Soybean Fermentation: Tempe, Kinema, Tua-nao, Natto. The roots of biotechnology in monsoon Asia (Abstracts). 1985. Tsukuba, Japan: Tsukuba Center for Institutes. 85 p. Held 15-17 July 1985 at Tsukuba, Japan. 26 cm. [Eng]

• **Summary:** For each paper there is a Japanese-language abstract (p. 1-38), and an English-language abstract (p. 43-85). On pages 39-41 are full-page ads for Kume-Natto, Marusan Sukoyaka Tenpe [Tempeh], and Torigoe Tenpe. Address: Japan.

1093. Kawakami, Kozo; Kimura, Eiichi. 1985. *Daizu ryôri kotoba no rekishi. Tôfu wa mukashi "tôfu" to kaita* [History of soyfoods terminology in Japan. "Tofu" was previously written with different characters]. *Daizu Geppo (Soybean Monthly News)*. July. p. 34-39. [8 ref. Jap]

• **Summary:** A full-page table (p. 39) lists all of the major Japanese soyfoods and gives a citation for the earliest Japanese-language document seen by the authors in which each of their names first appears. Address: 1. Nôgaku Hakase, Shusai, Ryori Genten Kenkyukai; 2. Daizu Geppo Staff.

1094. Kawakami, Kozo; Kimura, Eiichi. 1985. *Daizu ryôri*

*kotoba no rekishi* [History of soyfoods terminology in Japan: Itohiki natto (stringy natto) (Document part)]. *Daizu Geppo (Soybean Monthly News)*. July. p. 34-39. [2 ref. Jap]

• **Summary:** A full-page table (p. 39) lists all of the major Japanese soyfoods and gives a citation for each of their early names.

Itohiki natto: What we now call natto (*itohiki-natto*) was written as *itohiki daizu* ("string-pulling soybeans") in the old days. It was written like that in the entry for 19 Dec. 1405 in the *Noritoki-kyo ki (Diary of Noritoki Fujiwara)*, which is the earliest document seen that mentions natto. The author's name was FUJIWARA Noritoki, but he was usually called Yamashina Noritoki because this nobleman's family, which lived on land they owned in Yamashina near Kyoto, kept their diary for five generations. This Yamashina family was in charge of the supplies department for the Imperial Court (*Chotei*), and all supplies that went to the Court had to pass through this family, which recorded them in detail. Another diary was kept by the family's manager (*banto*), and it is even more detailed, containing all of the prices of the goods ordered, and including wages paid to laborers, carpenters, etc. Therefore it is also a very useful book. In those days people used natto in natto soup (*natto-jiru*), which was quite popular. The earliest document seen that mentions *natto-jiru* is the *Matsuya Hisamasa Chakai-ki (Diary of the Hisamasa Matsuya Tea Ceremony Group)*; *natto-jiru* was mentioned in the entry for 5 Sept. 1561. Mr. Matsuya was a rich merchant in the Nara area. His family kept their diary for three generations. Address: 1. Nôgaku Hakase, Shusai, Ryori Genten Kenkyukai; 2. Daizu Geppo Staff.

1095. Yacoumba, Doulaye. 1985. Un Burkinabé à Penne du Tarn [A man from Burkina Faso in Penne du Tarn]. *Lettre de l'ARTS* No. 2. p. 2. Summer. [Fre]

• **Summary:** For some years soybeans have been cultivated in small amounts by the peasants of Burkina Faso. Up until now they have been used to make Soumbala [sumbala], a ball-shaped fermented soy product, that is an important source of protein used for seasoning sauces. In hopes of diversifying the uses of soya in his country, where soybean acreage for food use is growing, the author worked at St. Paul de Mamiac during 16-23 July 1985 where he learned how to make tofu. He hopes to introduce tofu to Burkina Faso.

A photo shows Mr. Yakoumba, sent by the Minister of Agriculture of Burkina-Faso, and M.P. Boyer, mayor of Penne.

Note 2. This is the earliest document seen (Jan. 2012) that uses the word *Soumbala* to refer to dawadawa, a condiment made from soybeans instead of the traditional *Parkia* seeds. Address: Ministry of Agriculture, Burkina Faso, Africa.

1096. Barrett, Clare. 1985. A practical guide to soyfoods.

*Vegetarian Times*. Aug. p. 33-40. No. 96. [14 ref]

• **Summary:** An overview of fresh green soybeans, whole dry soybeans, soynuts, soy sprouts, soy flour & soy grits, soy oil, soy protein isolates, soymilk, okara, tofu, tempeh, soy sauces, miso, natto. Concludes with a list of 14 recommended books on soyfoods.

1097. Eckett, Alison. 1985. Beating the protein crunch: A growing number of people are discovering the range of soyfoods, both traditional and modern, that can be made from this bean. *Food Processing (UK)* 54(8):25-28. Aug.

• **Summary:** “The term ‘soyfoods’ is a recent generic expression that has been used to describe the complete range of soy products prepared for human consumption. It covers both high technology, modern products such as soy [protein] fibres, concentrates and isolates which are mainly used as ingredients by food manufacturers... and includes the traditional low technology products of soymilk, soy sauce, miso, natto, tofu, tempeh and soy sprouts that have formed part of the staple diet in East Asia for thousands of years.”

Soyfoods are divided into non-fermented and fermented. Photos show: (1) Miso Dip (front of two packages). (2) Cubes of tofu under water. (3) Nasoya Tofu Vegi-Dip. (4) Sliced cakes of tempeh. (5) The front of four tempeh packages, made by The Tempeh Works. (5) White Wave tempeh, a tempeh burger, and a promotional piece. (6) A box of Tofu Lasagna, made by Legume, Inc. (7) The front of a package of “6 All Natural Vanilla Ice Bean Sandwiches,” made from Ice Bean by Farm Foods.

1098. Hesseltine, C.W. 1985. Fungi, people, and soybeans. *Mycologia* 77(4):505-25. July/Aug. [92 ref]

• **Summary:** In this Mycological Society of America Annual Lecture, presented on 7 Aug. 1984 at Colorado State University (Fort Collins, Colorado), Dr. Hesseltine gives a nice history of the research conducted by him and others at the Northern Regional Research Center (NRRC) on Asian soybean fermentations, including fermented tofu (Frank Meyer, early USDA plant explorer, in a letter dated 21 Nov. 1916, states: “Parcel No. 125c contains first quality Chinese soybean cheese: please taste a little on the point of a knife; it is extremely appetizing.”), sufu, shoyu, miso, tempeh, Chinese black beans (fermented black soybeans), natto, and “the use of lactic acid bacteria to produce a yogurt product from soybeans.” He also studied non-fermented tofu.

Dr. Hesseltine pays a nice tribute to the work of Dr. A.K. Smith of the NRRC (p. 506-07). After his trip to East Asia shortly after World War II, Dr. Smith (a protein chemist) made great efforts to promote cooperation between the USDA, particularly the NRRC, and Japan in conducting research to understand how our exported soybeans were used for food. He had the foresight to recognize the importance of studying soybeans used in such huge quantities for processing into human food. Dr. Smith was instrumental in

arranging for two Japanese scientists (Dr. Tokuji Watanabe and Dr. Kazuo Shibasaki) to come to the NRRC to do research on tofu and miso. “This really began a new era of research on use of Oriental methods to produce foods from soybeans” (p. 507).

“My first real involvement in fermentation of soybeans was the arrival [in Oct. 1958] of Professor K. Shibasaki of Tohoku University to study the miso fermentation. He was sponsored by the American Soybean Association and USDA’s Foreign Agricultural Service. When he arrived, I was told that since I was curator of the mold collection and since the *Aspergillus oryzae* strains used in the miso process were in my charge, I would be the person he would work with. I had no background and no interest in soybean fermentations, but this was a fortuitous happening because it acquainted me with Oriental food fermentations. All my background was in conventional liquid agitated pure culture fermentation. The miso fermentation introduced me to two new concepts in fermentation: (1) solid state fermentation, and (2) use of mixed pure culture inoculum” (p. 510).

“Probably my interest in fermented foods would have abated had it not been for the acceptance of Mr. Ko Swan Djien of Indonesia, who came to us in 1960 for practical training. In my first discussion with him, we talked about the kind of work he would do. Since I knew that a fermentation was conducted in Indonesia using soybeans and reportedly the fermentation organism was a species of *Rhizopus*, I asked him if he was familiar with the product; his answer was yes, that he often ate it, but he knew nothing about how the fermentation was conducted. It was decided that during his 6 months at Peoria this might be an interesting subject to study, especially since he could obtain samples of the tempeh cake from his wife, who was in Java and could tell good tempeh from bad. Dried samples were quickly obtained; from these cakes, four species of *Rhizopus* were isolated” (p. 514-15). Eventually many strains of *Rhizopus* were isolated and investigations showed that *Rhizopus oligosporus* strain NRRL 2710 produced especially good tempeh.

Photos show four famous Japanese scientists who studied fermented foods: (1) Prof. Teizo Takahashi. (2) Ryoji Nakazawa. (3) Kin-ichiro Sakaguchi. (4) Kendo Saito. Address: NRRC, ARS/USDA, Peoria, Illinois.

1099. *Toyo Shinpo (Soyfoods News)*. 1985. Nattô girai wa son o suru: Ryôri no barieishon. Nattô mo konna ryôri ni henshin [If somebody doesn’t like nattô, too bad for them: Cooking variations. Natto can change into these kinds of recipes]. Sept. 21. p. 9. [Jap]

• **Summary:** Three photos show three different dishes, including Natto loaf and Natto ankake.

1100. Martin, Bradley K. 1985. You have to be crazy—or Japanese—to eat natto. *Wall Street Journal*. Sept. 25. p. 35.

• **Summary:** One American who thought he could eat

anything was not prepared for “his confrontation with *natto*. That fermented soybean product proved to be ‘gooey and flesh-colored.’ It ‘sort of smelled like peanut butter that had been out in the sun for a month.’ The appearance was vile, ‘just the sort of stuff you imagine when you hear the word “ooze.””

“Worst of all was the taste. The American struggled, vainly, to swallow.” Veteran expatriates and Japanese proclaim with near unanimity: “Foreigners can’t stand *natto*.”

“Japanese await with smiling anticipation the horrified reaction of a foreigner trying *natto* for the first time, starting with the first whiff, and then the daunting sight of the whitish, cobweb-like trails that the sticky beans form between bowl and chopsticks.”

But now ethnologist Shuji Yoshida of Osaka’s national museum has developed a “*natto* triangle” theory, which says that similar fermented soybean products are eaten inside a triangle having as its corners Japan, Indonesia, and the India-Burma border. *Pe-bout* is eaten in the Shan states of Burma, *akuni* in India’s Nagaland, and *kinema* in Eastern Nepal. He theorizes that all of these products trace their roots to a fermented soybean product developed in southern China in ancient times. The folk history of *natto* in Japan is then discussed.

Note 1. This is the earliest document seen (Dec. 2012) that mentions “*akuni*,” a close relative of Nepalese *kinema* and Japanese *natto*.

Note 2. This is the earliest document seen (Jan. 2012) that mentions “*Pe-bout*” and says that in the Shan states of Burma it is the name for a local food which is a close relative of Japanese *natto*. The source of his information is Japanese ethnologist Shuji Yoshida.

1101. Puzo, Daniel P. 1985. Food briefs: Getting cotton in. *Los Angeles Times*. Sept. 26. p. H26.

• **Summary:** California glandless cottonseed is in demand in Japan “because Japanese researchers are using the unusual ingredient in food products. The work centers on the creation of a cottonseed ice cream, a chocolate and *natto*, a traditional Japanese food, according to *California Farmer* magazine.” Address: Times staff writer.

1102. **Product Name:** [Big Dream Time Powdered Tempeh].

**Foreign Name:** Taimu Taimu.

**Manufacturer’s Name:** Nakasho Bussan.

**Manufacturer’s Address:** Japan.

**Date of Introduction:** 1985. September.

**Wt/Vol., Packaging, Price:** Bottle.

**New Product–Documentation:** *Toyo Shinpo* (Soyfoods News). 1985. Sept. 21. p. 8. “New tempeh product announced. Nakasho Bussan to sell it [powdered tempeh].” This new product called Taimu Taimu (Time + Big Dream) was developed by the Japan Natto Assoc. It is their first

commercial product. A 450 gm (1 lb) bottle sells for 6,000 yen (\$26.67). Use it in miso soup, milk, juices or just mix with hot or cold water.

1103. *Daily Leader* (Stuttgart, Arkansas). 1985. Teamwork: Researchers, marketers join forces to make Hartz efforts successful. Oct. 2. p. 4C. Insert.

• **Summary:** Genetic research and development of plant varieties today requires teamwork. Dan Lamberth, chief operating officer, says that Hartz is involved in a never-ending quest for excellence. The Plant Variety Protection Act of 1971, which protects a breeder’s patent on a new variety for 17 years, set the stage for Hartz’s current efforts. Until then, a plant breeder had no protection for his work and there was little incentive for private industry to develop research programs. Most plant breeding was done by state and federal government programs.

Since 1971 Hartz has developed nine varieties. “The main emphasis of Hartz Seed Company has been and remains the Southern soybean market... Hartz has also developed a program of food bean production for the Far East, which is an important, but not dominating, percentage of its business. Hartz 936X soybeans, grown in the United States and shipped to Japan and Korea, have been subject to substantial increases in sales during the past six to seven years... Hartz 936X soybeans have captured the best-quality, higher-priced *natto* market.” Hartz is also involved in both farm management and real estate. A photo shows Dan Lamberth seated at his desk.

1104. *Daily Leader* (Stuttgart, Arkansas). 1985. Far Eastern food market offers outlet for food-type soybeans. Oct. 2. p. 16C. Insert.

• **Summary:** Chris Hartz is manager of the Food Beans section of the Hartz Seed Company. He sells food-type soybeans in the USA and Far Eastern markets for use in making food products such as *natto*, tofu, bean sprouts, and soymilk. Hartz Seed Company has made a commitment to expanding its position in the soybean food markets and to taking a position as a leader in this field. A photo shows Chris Hartz, who is also involved in real estate.

1105. *Toyo Shinpo* (Soyfoods News). 1985. Nattô no peeji: Tenpe no jidai. Tenpe wa ayumi chakujitsu-ni [The *natto* page: The age of tempeh. Tempeh steps very steadily]. Oct. 21. p. 6. [Jap; eng+]

• **Summary:** An interview with Goro Kanasugi about tempeh and the Japanese Natto Association. Small photos show: (1) Portrait photo of Mr. Kanasugi. (2) Pieces of tempeh.

1106. Kanno, Akishige; Takamatsu, Haruki; Tsuchihashi, Noboru; Watanabe, Tomoko; Takai, Yuriko. 1985. Nattô no kenkyû. III. Nattô to hikiwari-nattô no seizô oyobi hozon-chû ni okeru tokoferooru ganyûryô no henka

[Studies on natto. III. Change in tocopherol contents during manufacturing and storage of “natto” and “hikiwari-natto”]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society for Food Science and Technology)* 32(10):754-58. (Chem. Abst. 104:67760). 15886 [13 ref. Jap; eng]

• **Summary:** The tocopherol content of soybeans (on a dry-weight basis) was increased by both soaking and steaming. Address: 1-2. Asahi Shokuhin Co., Ltd., 180-2, Wado, Ushibori-machi, Namekata-gun, Ibaraki 311-24, Japan.

1107. Latzke-Begemann, Ute; Walker, Judith. 1985. Soybean household utilization in South Western Nigeria. In: Proceedings of Tropical Soybean Workshop. 164 p. See p. 69-91. Held 30 Sept. to 4 Oct. 1985 at IITA, Ibadan, Nigeria. Unpublished manuscript. [1 ref]

• **Summary:** Contents: Introduction. Recipes: Preparation of soypaste. Ground soybean with ogi. Ground soybeans with rice. Tuwo with ground soybean paste. Sweet potato with ground soybeans. Pounded yam with ground soybeans. Vegetable soup with soybean paste. Soybeans with maize. Yam porridge. Soymilk. Akara. Moyin moyin. Iru or dadawa. Contains many photos, especially of soyfoods preparation at the Kersey Children’s Home at Ogbomosho. The recipes were developed at this Home, a situation which is recognisable to many low income African families, both rural and urban. The recipes use the simplest kitchen technologies.

Note: This is the earliest English-language document seen (Jan. 2012) that uses the word “dadawa” or the word “iru” to refer to dawa-dawa, a close relative of Japanese natto. Address: Socio-Economic Unit, Farming Systems Programs, IITA, Ibadan, Nigeria.

1108. Odunfa, S.A.; Adewuyi, E.Y. 1985. Optimization of process conditions for the fermentation of African locust bean (*Parkia biglobosa*). II. Effect of starter cultures. *Chemie, Mikrobiologie, Technologie der Lebensmittel* 9(4):118-22. Oct. [18 ref]

• **Summary:** Results show that the different strains of the *Bacillus subtilis* group were the main microorganisms responsible for iru (dawa-dawa) fermentation. *Bacillus licheniformis* was also used. Paired mixed cultures of isolates were not found to increase the rate of fermentation over that of single cultures. All the isolates had optimal growth at pH 7 to 8 while *Bacillus* species showed significant growth at pH 9. Natto and thua-nao are also discussed. Address: Dep. of Botany and Microbiology, Univ. of Ibadan, Ibadan, Nigeria.

1109. Yacoumba, Doulaye. 1985. Un Burkinabé à Penne du Tarn [Soybeans and sumbala in Burkina Faso]. *Point Soja-Soyfoods* No. 3. p. 3, 4. Autumn. [Fre; Eng]

• **Summary:** This same story, in both French and English, appeared in *La Lettre de l’ARTS*. No. 2. p. 2. Summer.—which see. Address: Ministry of Agriculture, Burkina Faso, Africa.

1110. Ahmadu Bello University, Agricultural Extension and Research Liaison Services. 1985. Soybeans in the Nigerian diet. *Ahmadu Bello University, Extension Bulletin*. No. 21. 74 p. Nov. Home Economics Series No. 1. [64 ref]

• **Summary:** See the original 1977 edition. Address: Agricultural Extension and Research Liaison Services, Ahmadu Bello Univ., P.M.B. 1044, Samaru-Zaria, North Nigeria.

1111. Hara, T.; Fujio, Y.; Ueda, S. 1985. *Bacillus subtilis* (natto) plasmid responsible for polyglutamate production encoding gamma-glutamyltranspeptidase. *J. of the Faculty of Agriculture Kyushu University* 30(2/3):95-105. Dec. [Eng]\* Address: Kyushu Univ.

1112. Zenkoku Natto Rengokai, Tenpei Fukyukai [Japan National Natto Association, Tempeh Popularization Group]. 1985. 21 seiki no kenko shokuhin wa kore da! [This is the health food of the 21st century (Leaflet)]. Japan: Zenkoku Natto Kyodo Kumiai Rengokai. 3 panels each side. Front and back. Each panel: 22 x 9 cm. [Jap]

• **Summary:** A color leaflet (see next page). “Tempeh is a distant relative of natto.” Contains recipes (with tempeh) for: Curry rice. Gyoza (Pot stickers). Tempeh kabayaki domburi. Tempeh banana donuts. Happosai. Potato croquettes. Seafood salad.

A nice chart compares the nutrients in tempeh and beef.

1113. Beuchat, Larry R.; Nakayama, T.; Phillips, R.D.; Worthington, R.E. 1985. [Comparison of soybeans, peanuts and cowpeas as substrates for preparing natto]. *Hakko Kogaku Zasshi (J. of Fermentation Technology)* 63:319-24. [Jap]\*

Address: 1. Dep. of Food Science, Univ. of Georgia, Agric. Exp. Station, Experiment, GA 30212, USA.

1114. Ikeda, H.; Tsuno, S. 1985. [The componential changes during the manufacturing process of natto. Part II. On the water-soluble proteins]. *Shokumotsu Gakkaishi* 40:27-37. (Chem. Abst. 104:128586). [Jap]\*

1115. Latzke-Begemann, Ute. 1985. Soybean dadawa [dawa-dawa] production in southern Kaduna State. Ibadan, Nigeria: IITA. \*

• **Summary:** There was a small localized market for soybeans in Kafanchan in Kaduna state, which was the center for the production of a local seasoning (daddawa), the main ingredient of which is locust bean (*Parkia clappertonia* and *P. filicoides*). In the late 1970s daddawa producers started substituting soybean for locust bean. This helped to maintain a small demand for soybean. Address: Socio-Economic Unit, Farming Systems Programs, IITA, Ibadan, Nigeria.

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1116. Watanabe, Sugio. 1985. [Manufacturing technique of natto and process of packaging]. *Shokuhin to Kagaku (Food and Science)* 20:1-5. [Jap]\*

1117. Aubert, Claude. 1985. Les aliments fermentés traditionnels: Une richesse méconnue [Traditional fermented foods: An unrecognized richness]. Paris: Terre Vivante. 261 p. Index. 21 cm. Series: Collection les Vrais Aliments d'Aujourd'hui et de Demain. [173\* ref. Fre]

• **Summary:** The author gives good, brief introductions to the fermented soyfoods tempeh, miso, miso pickles, shoyu, tamari, sufu, natto, soy idli, and hamanatto. Related foods that are also discussed include koji, amazake (amasaké), and ontjom. See especially chapter VII: The fermentation of legumes (p. 73-78). Part IV (p. 153-216) is a dictionary of fermented foods and beverages, in which they are listed alphabetically; basic information and references for each are given. Instructions are given for preparing many of these foods on a home scale, and for some foods (such as tempeh) even recipes are given (fried tempeh, tempeh goreng). The book contains many beautiful illustrations and an excellent bibliography. The author acknowledges his extensive use of the material in *Handbook of Indigenous Fermented Foods* (1983) edited by K.H. Steinkraus. Address: Ingénieur agronome de formation, France.

1118. Bradford, Peter; Bradford, Montse. 1985. *Cooking with sea vegetables: A collection of naturally delicious dishes using to the full the bountiful harvest of the oceans.* Wellingborough & New York: Thorsons Publishing Group. 144 p. Illust. by Sue Reid. Index. 22 cm. [8 ref]

• **Summary:** The Bradfords have spent considerable time studying food in Japan and are especially well qualified to present this vegan, macrobiotic cookbook. It contains definitions of and/or recipes for using tofu, tempeh, miso, natto ("The taste of these sticky fermented soya beans is either loved or hated. It is somewhat like a very ripe cheese"), shoyu (soy sauce), and seitan. Address: UK.

1119. Hume, D.J.; Shanmugasundaram, S.; Beversdorf, W.D. 1985. Soyabean (*Glycine max* (L.) Merrill). In: R.J. Summerfield and E.H. Roberts, eds. 1985. *Grain Legume Crops.* London: Collins. xvi + 859 p. See p. 391-432. Illust. Index. 24 cm. [192 ref]

• **Summary:** Contents: Introduction: History, current status and future projections. Principal economic yield and uses of crop products. Principal farming systems. Botanical and agronomic features: Symbiotic nitrogen fixation potential. Principal limitations to production and yield: Developing countries, developed countries. Fertiliser requirements. Quality of seed constituents. Germplasm resources. Principal breeding strategies: Adaptation to new geographic areas, breeding methodology, breeding objectives, seed quality, pest and disease tolerances, current trends in soyabean breeding.

Avenues of communication among researchers (INTSOY, AVDRDC, IITA, FAO). Prospects for larger and more stable yields.

Tables: (1) Area (1000 ha), yield (kg per ha), and production (1000 tonnes) of soyabeans from 1969-71 to 1982. (2) Maturity durations and productivity potentials of soyabeans in selected countries. (3) *Glycine* species collections around the world. (4) Sources of resistance among soyabeans to selected insect pests. (5) Sources of resistance among soyabeans to selected diseases.

Table 9 shows that there are soybean germplasm collections in 15 countries. This table has 4 columns: Country, location (city), curator, and no. of accessions. AVRDC in Taiwan has the largest germplasm collection in one location (10,400 accessions, Tainan), followed by USA (9,648, Illinois and Mississippi), India (4,000, Pantnagar; 1,800 Amravati), Japan (3,541, Tsukuba; 200, Morioka), USSR (3,000, Leningrad), China (3,000 Jilin; 3,000 Hubei; 2,930 Shadong [sic, Shandong {W.-G. Shantung}]; 2,500 Beijing; 960 Heilungjiang [Heilongjiang]). Also: Australia 400, France 500, Nigeria 1,300, Indonesia 600, South Korea 2,833, North Korea 300, South Africa 600, Sweden 1,200, and Thailand 1,686. Address: 1&3. Univ. of Guelph, Dep. of Crop Science, Guelph, Ontario N1G 2W1, Canada; 2. Asian Vegetable Research and Development Centre (AVRDC), PO Box 42, Shanhua, Tainan 741, Taiwan, Republic of China.

1120. *IITA Research Highlights.* 1985. On-farm performance of a new soybean and the use of soybeans in treatment of protein malnutrition in infants. p. 6-8. For the year 1984.

• **Summary:** A new soybean line—TGx 536-02D—has been developed by IITA to meet the increasing demands of farmers in the central and northern Guinea savannas of Nigeria, which are outside the traditional soybean growing areas. This new line, with a maturity of 105 to 110 days, is higher yielding and earlier maturing than the widely grown Malayan variety, which was introduced into Nigeria in the early 1900s and which matures in about 140 days.

"An expanding market for soybean is due largely to the popularity of soybeans to prepare 'dawadawa,' a fermented paste used as a flavoring. There is also a growing interest in using soybean milk and flour as an important source of proteins for feeding babies and young children."

"An outstanding example of the promotion and use of soybeans to combat infant protein malnutrition (kwashiorkor) in a Nigerian rural area was recently brought to the attention of IITA scientists. A children's home near Ogbomosho specializes in treating infants with severe symptoms of malnutrition, e.g. swollen bellies and skeletal limbs... The infants are admitted to the children's home with their mother or guardians who prepare all the food for themselves and their babies under the supervision of the staff. Soybeans are prepared as a milk substitute by boiling, grinding, straining, and recooking this liquid. This "milk" contains about 35

gm of protein per serving. It is especially important because about 40% of the infant ‘patients’ are intolerant to cow’s milk. Also, soybeans are prepared as a wet-milled full-fat flour added to a cereal pap. A normal ration for a one to two year-old child is the equivalent of about 200 gm of whole soybeans per day at a cost of approximately 20 cents (U.S.).

“Not only are staff members of the children’s home concerned with the infants brought to them, but they visit villages near Ogbomosho to promote the cultivation and use of soybeans and teach women how to prepare them in local dishes. Several farmers—both men and women—in the area are now growing the crop and soybeans are being sold in local markets.

“Women in other African countries including Ghana, Cameroon, Uganda, Rwanda, and Zaire, are also using soybeans in local dishes. A village with small-scale equipment can provide soybean oil and meal for partially defatted soybean flour.”

Photos show: Nigerian mothers preparing soybean milk for their babies at the children’s home near Ogbomosho, Nigeria. A mother bottle-feeding soybean milk to her baby. A mother preparing soybean/cereal pap for her infant. Address: Ibadan, Nigeria.

1121. Kushi, Aveline; Esko, Wendy. 1985. *The changing seasons macrobiotic cookbook*. Wayne, New Jersey: Avery Publishing Group, Inc. xii + 265 p. Illust. Index. 28 cm. [43 ref]

• **Summary:** The recipes are arranged by the four seasons. The index contains 43 entries for miso, 39 for tofu, 35 for tamari, 18 each for seitan and tempeh, 3 for natto, and 1 each for Japanese black [soy] beans, and for soybeans (dry).

Also contains entries for amazake, amazake pudding, azuki beans, brown rice, hiziki [hijiki], kuzu, mochi, and sea vegetables. Address: Brookline, Massachusetts.

1121a. Shurtleff, William; Aoyagi, Akiko. 1985. *The natto industry and market*. In: William Shurtleff and Akiko Aoyagi. 1985. *Soyfoods Industry and Market: Directory and Databook 1985*. 5th ed. Lafayette, California: Soyfoods Center. 220 p. See p. 118-20. As the following statistics (see next 2 pages) show, the natto market in Japan has expanded steadily throughout the postwar period.

1122. Noh, Chin-hwa. 1985. *Traditional Korean cooking: Snacks & basic side dishes*. Elizabeth, New Jersey; Seoul Korea: Hollym Corporation. 78 p. Illust. (color). Index (general). Index of Korean recipe titles. 27 cm. [Eng; kor]

• **Summary:** This is an excellent cookbook of authentic Korean recipes, each with its Korean name (romanized and in Korean characters). Each recipe is accompanied by numerous useful color photos. The front matter contains an Introduction, Preparation tips, and 2 pages about the healthy Korean diet. Soy related recipes include: Soft bean

curd soup (*Sundubutchigae*, p. 10). Seasoned fermented soybean soup (*Ch’onggukchangtchigae*, with 1 cake bean curd and 6-8 tablespoons seasoned fermented soybeans, p. 11 [ch’onggukchang is Korean style natto]). Royal soybean paste soup (*Kungjungdoenjangtchigae*, with 2 tablespoons soybean paste [Korean miso], p. 12). Bean curd casserole (*Tubu Chon-gol*, p. 13). Wrapped bean curd (*Tubussamtchim*, p. 15). Stuffed bean curd (*Tubusobagi*, p. 16). Steamed bean curd (*Tubuson*, p. 16-17). Bean curd in soy sauce (*Tubut’wigimjorim*, p. 18). Salted bean curd and beef (*Tubu Soemgogijorim*, p. 18). Salted beans (*K’ongjorim*, with 1 cup black beans plus soy sauce, sugar, sesame seeds, and sesame oil, p. 19). Cold cooked bean curd (*Tubu Naengch’ae*, p. 22). Bean sprout rice (*K’ongnamulpap*, with 2/3 lb. [soy] bean sprouts, p. 24). Dried radish strips in soy sauce (*Muumallaengijangatchi*, p. 54). Cucumbers in soy sauce (*Oijangatchi*, p. 55). Sesame leaves in soy sauce (*Kkaennipchangatchi*, p. 56). Todok in red sauce (*Todokchangatchi*, with 1 cup soy sauce, p. 56). Fermented soybean lumps (*Meju*, with 18 lb. dried yellow soybeans, p. 62-63). Soy sauce (*Kanjang*, homemade, p. 62-63). Soybean paste (*Toenjang*, homemade, p. 63). Red pepper paste (*Koch’ujang*, homemade, with 2 lb. fermented soybean powder, 6 lb. glutinous rice powder, p. 64).

Note 1. This is the earliest English-language document seen (Jan. 2012) that uses the word “ch’onggukchang” to refer to Korean-style natto.

Note 2. This is the earliest English-language document seen (March 2009) that uses the word “Toenjang” to refer to Korean-style soybean paste (miso), or the word “Koch’ujang” to refer to Korean-style fermented red pepper and soybean paste (miso).

The useful Glossary (p. 73-75) contains definitions of: Bean curd (*tubu*). Beans, incl. yellow soybeans (*huink’ong*) which are used to make [soybean] sprouts (*k’ongnamul*), bean curd (*tubu*), soft bean curd (*sundubu*), bean paste (*toenjang*), fermented soybeans for making soy sauce (*meju*), seasoned fermented soybeans (*ch’onggukchang* [Korean natto]), soybean flour (*k’ongkaru*), soy sauce (*kanjang*).

Brown soybeans (*pamk’ong*—literally “chestnut beans”) are a chestnut brown color and have a smooth chestnut-like texture when cooked.

Black soybeans (*komunk’ong*) are served as a side dish.

Mung beans (*noktu*), used to make mung bean sprouts (*sukchu namul*), etc. Red kidney beans [azuki] (*kangnamk’ong*).

Bean sprouts (*k’ongnamul*) may be grown at home or purchased in the vegetable section of most grocery stores. The large sprouts are from the yellow soybean; the smaller, more delicate sprouts are from the green mung bean.

“Soybean paste (*toenjang*) is a thick brown paste made from a mixture of mashed fermented soybean lumps [soybean koji] (left from making the soy sauce), powdered red pepper seeds and salt. It is used as a thickener for soups

**NATTO PRODUCTION AND CONSUMPTION IN JAPAN**

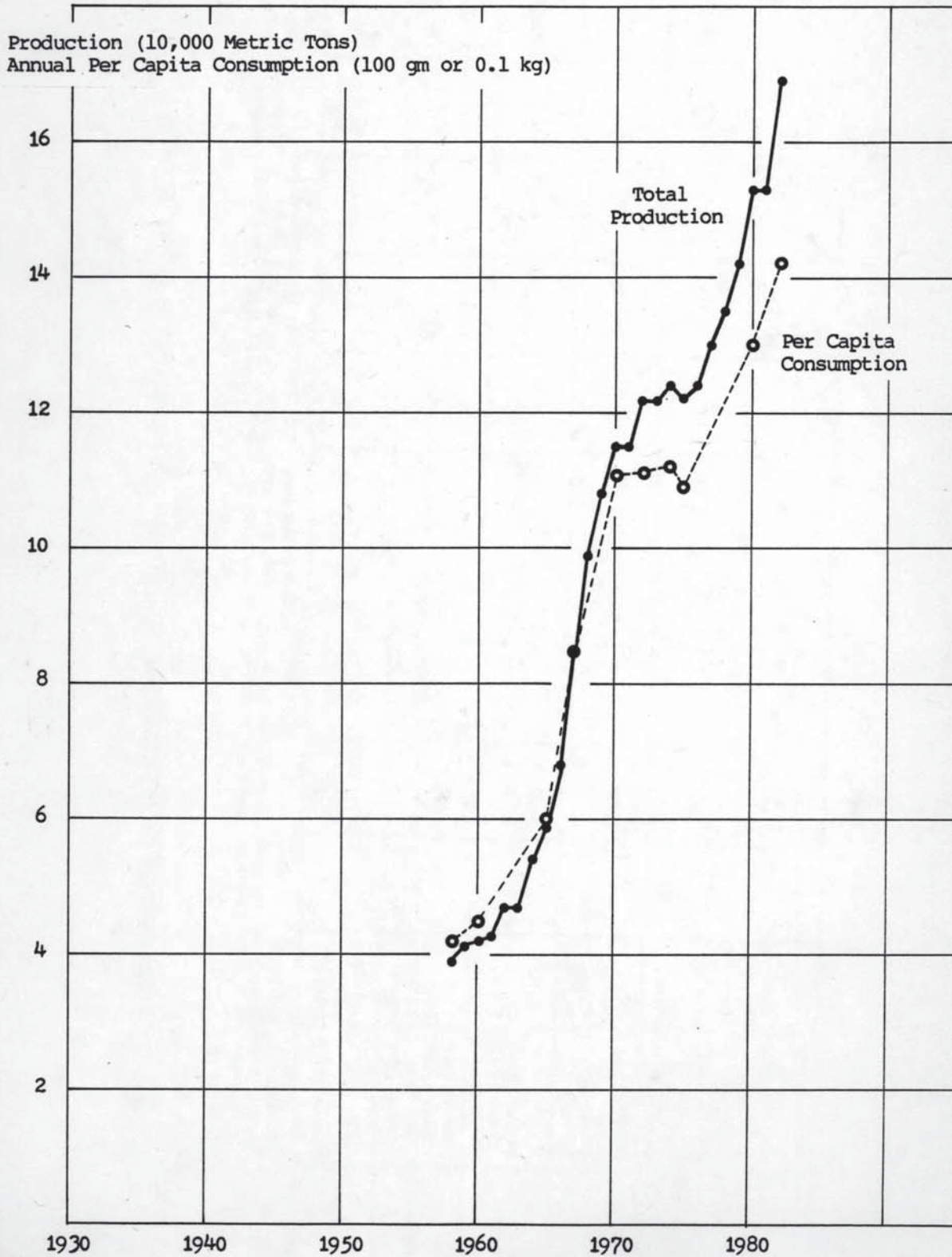
Year	Natto Consumption (Metric Tons)	Population of Japan (Million)	Per Capita Natto Consumption (kg/yr)
1958	39,000	91.77	0.42
1959	41,000		
1960	42,000	93.42	0.45
1961	43,000		
1962	47,000		
1963	47,000		
1964	54,000		
1965	59,000	98.28	0.60
1966	68,000		
1967	85,000	100.20	0.85
1968	99,000		
1969	108,000		
1970	115,000	103.72	1.11
1971	115,000		
1972	122,000	107.60	1.13
1973	122,000		
1974	124,000	110.57	
1975	122,000	111.94	1.09
1976	124,000		
1977	130,000		
1978	135,000		
1979	142,000		
1980	153,000	117.06	1.30
1981	153,000		
1982	169,000	119 est	1.42

Source: Norin Suisansho Shokuhin Yushi-ka; or Sorifu no Kakei Chosa, Tokei Kyokyoku 1983.

These figures show that natto production in Japan, from 1958 to 1982, has grown at the average compound rate of 6.2% a year. This is impressive, especially when we consider that per capita consumption of Japan's two other major fermented soyfoods, shoyu (soy sauce) and miso, have declined during this period. Equally promising, the second-largest annual production increase in postwar history took place in the most recent year (1982), an increase of 16,000 tonnes, or 10.4%. Major reasons for this increase were (1) The growing reevaluation in Japan of the nutritional value of traditional soyfoods; (2) The growing interest in natural foods; and (3) the expansion of natto consumption in western Japan.

Nevertheless, per capita natto consumption is still relatively small, only 1.4 kg a year in 1982, compared with about 12 kg for shoyu and 6 kg for miso.

**NATTO PRODUCTION AND CONSUMPTION IN JAPAN (1950-1980s)**



and stews and will keep well in the refrigerator.

“Soy sauce (*kanjang*) is a brownish-black salty liquid made by cooking fermented soybean cakes with water and salt. Each household in Korea used to make their own soy sauce in the spring; some still do. These are mild and add good flavor to most any food.” Soy sauce is used in cooking and at the table. Japanese “soy sauce is less salty but sweeter than Korean soy sauce.

“Sweet red beans (*p’at*) are small and round and used widely in Korean confections. When cooked and mashed they are sweet and soft textured. This sweet bean puree [Japanese *an*] is used as filling in rice cakes [mochi] and also now in donuts and rolls.”

The Glossary also mentions laver (*kim*), a sea vegetable called “nori” in Japan, that is widely used in recipes in this book. No other sea vegetables are mentioned. Address: Munhwa Cooking School.

1123. Odunfa, S.A. 1985. African fermented foods. In: B.J.B. Wood, ed. 1985. Microbiology of Fermented Foods. Vol. 1. Essex, England: Elsevier Science Publishing Co. xx + 371 + 14 p. See p. 155-91. [122\* ref]

• **Summary:** In the middle belt of Nigeria, local soybean varieties are used in place of locust beans (fermented with *Bacillus subtilis*) to make iru (the Yoruba name for dawadawa), which resembles Japanese natto. Address: Dep. of Botany & Microbiology, Univ. of Ibadan, Nigeria.

1124. Ontario Soya-Bean Growers’ Marketing Board. 1985. Soybeans: Nature’s miracle—teaching unit. Chatham, Ontario, Canada: OSGMB. 33 p. Undated. 28 cm.

• **Summary:** This interesting portfolio of materials is designed to teach children in Ontario, Canada, about the growth development of a soybean from seed to mature plant, soybean cultivation, soybean processing and products, the importance of soybeans to Ontario’s economy, and the Ontario Soya-Bean Growers’ Marketing Board.

Contents: Introduction to teacher’s unit. 1. From seed to pod: A brief history of soybeans in Canada, biology of the soybean seed, its germination and seedling growth, soybean nodules and rhizobia bacteria, parts of a young soybean plant, reproductive stages from flowering to maturity, corn heat units, tillage, word scramble.

2. Soybeans—Nature’s miracle: A brief history of soybean utilization, ways that soybeans are used, soy oil, meal and soyfoods, recipes, word search. 3. Imports and exports: Importance of soybeans to the economy of Canada and Ontario, how soybeans get to market, The Ontario Soya-Bean Growers’ Marketing Board.

A table on page 20 shows “Soymeal consumption by Ontario’s livestock and poultry.” Hogs consume 45% of the total (the total is 503,000 tonnes), poultry 34%, dairy cattle 20%, and beef cattle 1%. Page 22 notes that the bulk of Ontario’s soybean exports (77%) are sold to East

Asia—especially Japan, Hong Kong, Singapore, Malaysia, Indonesia, and Korea. Soyfoods are listed and discussed in a positive way, with recipes for: Bran muffins (with soy flour and soy oil). Tofamole (tofu guacamole). Tofu fruit pudding. Tofu shake.

Note: This is the earliest English-language document seen (Dec. 2003) that contains the term “Tofu shake.”

The three largest farm crops in Ontario in terms of total area are hay (1,050,000 ha), grain corn (902,000 ha), and soybeans (425,000 ha). Address: Chatham, ONT, Canada.

1125. Sahn, Julie. 1985. Classic Indian vegetarian and grain cooking. New York, NY: William Morrow and Co. 511 p. Illust. Index. 25 cm.

• **Summary:** Page 75 discusses clarified butter (*Usli Ghee*) and Indian vegetable shortening (*Vanaspati Ghee*.) Butter in India is called *makkhan*, and *usli* (pronounced OOS-lee, not YEWS-lee) means “real” or “pure.” *Usli ghee* has a light caramel color and a heavenly aroma. Since it contains no moisture, it keeps well covered, at room temperature, for several months. Describes how to make clarified butter at home.

*Vanaspati* means “vegetable.” Unlike American shortening which is chalk white, flavorless, and odorless, it is a creamy yellow color and has a nutty aroma very similar to that of *usli ghee*—which is very expensive and for which it is an inexpensive substitute. “Hindu Brahmins and Jains consider this shortening an imposter and scorn the mere thought of eating it. They seriously believe that India’s problems today are due to all the adulterated fat (another name for vegetable shortening used primarily by *usli ghee* eaters) consumed by the masses.”

1126. Salunkhe, D.K.; Kadam, S.S.; Chavan, J.K. 1985. Postharvest biotechnology of food legumes. Boca Raton, Florida: CRC Press. 160 p. Illust. Index. 26 cm. [25 soy ref]

• **Summary:** Contents. 1. Introduction. 2. Seed structure, production, and distribution (Soybean, p. 8-10, 17-18). 3. Chemical composition. 4. Nature and causes of losses. 5. Harvesting, threshing, and drying (Soybean, p. 69-70). 6. Storage. 7. Processing and utilization (Soyfoods, p. 121-36). 8. Food legumes in protein crisis.

Chapter 7, “Processing and utilization,” discusses tofu, tempeh, soy flour, soymilk, miso, shoyu, natto, Hamanatto, and cereal-soy blends. Address: 1. Vice-Chancellor; 2. Prof. of Food Science & Technology; 3. Asst. Food Science & Technol. All: Mahatma Phule Agricultural Univ., Rahuri, Maharashtra State, India.

1127. Simas, Luiz; Joels, Bobbi. 1986. Re: Miso, tempeh, shoyu, and macrobiotics in Brazil. Letter to William Shurtleff at Soyfoods Center, Jan. 7. 2 p. Typed, with signature on letterhead. [Eng]

• **Summary:** “When we returned to Brazil from the USA

in Nov. 1981, we decided to hold a series of classes on natural foods processing, including a class on making tempeh at home. (Tempeh was completely unknown around here at that time.) We also began to make tempeh for our own consumption, but ended up setting up a small shop in our apartment. Because of the limited space, our tempeh production never went beyond 50 pounds per month, in spite of the large demand. So after a year or so, as we had originally planned, we handed the business over to a couple of friends who, unfortunately, for many reasons, were not able to continue tempeh production.

“However there is now another group of people making and selling tempeh here in Rio: Jurema and Mariá Paulinho, Rua Raimundo Correia, 27, apt. 504, 22.040 Rio de Janeiro (RJ), Brazil. Phone: (021) 237-7897. We will always be available for providing any kind of information about or classes on tempeh. One of our dreams is to see tempeh introduced in Brazil’s tropical northeast, where an incubator would not be necessary.

“At present we are involved in setting up miso and koji production in our house in the mountains of Minas Gerais for the coming year (1986). It’s an old dream, but it looks like it will finally come true. At first it will be a small-scale farm-house style production.

“Miso and shoyu, as well as tofu, are soy products with a long history in Brazil, mainly due to the large number of Japanese immigrants in Sao Paulo. There are many shops there and some here in Rio which sell Oriental products, including miso, shoyu, tofu and natto. Nevertheless, they are usually semi-industrialized and include sugar, preservatives, etc. among the ingredients.

“Production and consumption of quality miso, shoyu, tofu and natto only began with the arrival of Tomio Kikuchi, a student of George Ohsawa’s and one of the first people to introduce macrobiotics to Brazil. Until today the best known good quality miso and shoyu are the miso and shoyu distributed by Kikuchi’s Instituto Princípio Unico. There are, however, other good misos as well.

“Instituto Princípio Unico, Sao Paulo (SP); Arma-Zen Produtos Naturais Ltda., Rio de Janeiro (RJ); Terrazul, Nova Friburgo (RJ).

“We’re sure there are many, many small producers of quality miso and shoyu all over Brazil, but we don’t know their addresses. There is also a large company which claims to devote part of its production to naturally-fermented miso and shoyu, with no sugar. The company’s name is Tozan. Their factory address is: Bairro Carlos Gomes s/nº, Campinas (SP); phones: (011) 278-2495 or (011) 278-5826.

“There are also two individuals who have a lot of experience in making miso and koji at home. They are available to provide information as well. They are: Dr. Sakae Maki, Praia de Botafogo, 428, s/304, Rio de Janeiro (RJ), phone: (021) 266-0503; Edson Hiroshi Seó, Fazenda Escola, 45.260 Poçoas (BA), phone: (073) 431-1108.

“We will continue to give classes on making homemade miso here in Rio, and we plan on eventually turning our small miso shop in the mountains into a school. We will always be available for any type of assistance or information concerning soy products.

“Several years ago the Brazilian Government tried to introduce soybeans in the public’s diet. It was a complete fiasco, mainly because of the lack of information on the part of the authorities. They simply tried to introduce soybeans as a substitute for the traditional black (turtle) beans, and soy milk as a substitute for cow’s milk. It didn’t work.” Address: Rio de Janeiro, Brazil.

1128. *Toyo Shinpo (Soyfoods News)*. 1986. Ryôri no barieshon: Natta o tsukutta hozonshoku roku-shu [Cooking variations: Six people offer recipes for using natto]. Feb. 21. p. 9. [Jap]

• **Summary:** The recipes are: (1) *Soboro nattô*. (2) *Nattô no hachimitsu-zuke*. (3) *Sakaru-zuke*. (4) *Tôzô*. (5) *Nattô-sake*. (6) *Hoshi-natto*. Address: Japan.

1129. Rocheman, Marc. 1986. Les aliments fermentés dérivés du soja [Fermented foods derived from soya]. *Biofutur* No. 43. p. 34-42. Feb. [8 ref. Fre]

• **Summary:** Gives the composition and nutritive value of various soy products: tofu, fermented tofu (sufu), miso, natto, shoyu, and tempeh. Describes the possibilities for use of koji, as a source of proteases and peptidases, in the production of these fermented foods.

1130. Tsuji, K.; Tsuji, E. 1986. Effect of natto-feeding on cholesterol level of rats. *Eiyogaku Zasshi (Japanese J. of Nutrition)* 44(1):41-44. Feb. [16 ref. Jap; eng]\*

1131. Ferguson, Jane. 1986. The secrets of making sushi. *Guardian (England)*. March 7. p. 18.

• **Summary:** At the kitchen in the prestigious cookery bookshop, Books for Cooks (4 Blenheim Crescent, London W1), Lesley Downer teaches a class in the Japanese art of sushi making. She explains that the ingredients can include “spinach, mushrooms and the infamous natto (fermented soy beans),...”

1132. *Toyo Shinpo (Soyfoods News)*. 1986. Tenpe no hansoku ni hongoshi. Zenkoku Nattô Rengôkai Tenpe Fukyûkai tairyô na panfu o sakusei [They’re putting real effort into promoting tempeh. The Japan Natto Assoc. Tempeh Popularization Group has published many pamphlets]. March 21. p. 10. [Jap; eng+]

• **Summary:** Pamphlet title is “This is the health food of the 21st century.” Goro Kanasugi is head of the Tempeh Popularization Group. Address: Kyoto, Japan.

1133. *Nihon Keizai Shinbun*. 1986. Nattô, Tai ni sato gaeri.

Ryûgakuchû no Tai kagakusha keikaku. Seizô puranto no sekkei kanryô [Natto going back to Thailand which is thought to be its native country. Thai scientist who is studying in Japan is planning. Design of natto production plant is completed]. March 28. [Jap]

• **Summary:** A photo shows two men at a drafting table, apparently looking at the natto plant design.

1134. Sacolick, Diane. 1986. Where life and livelihood meet: A family macrobiotic food business produces amasake, natto, and mochi amidst the rural Berkshires [Kendall Food Co.]. *MacroMuse*. Winter/Spring. March. p. 24-28.

• **Summary:** “When the Kendalls started making amasake, they began with one five-gallon pot. Today they have the capacity to make 100 gallons of amazake a day with their four 30-gallon pots... Charlie thinks he invented the ‘milk shake’ form of amasake.”

On a typical day, wakeup time is 5:00 or 6:00 a.m. Charlie only need take a few steps from his home kitchen to the shop. The first job is to pressure cook the rice for the amasake... in a 10-gallon pot. The rice is then allowed to cool overnight slowly without opening the pressure cooker. The next morning the rice is put in earthenware crocks and the koji is mixed in. The earthen crocks give the amasake more of a chocolate like taste. Here it is kept at a temperature of 135-140°F and occasionally stirred for 24 to 30 hours. Then the amasake is ground with blenders and put into a bottling vessel. It is topped with boiling water so the thick amasake will have more the consistency of a drink. Here it sits overnight before it is bottled, put into a walk-in refrigerator for a few days and shipped out.

“Only organic ingredients are used. Koji is prepared especially for the Kendalls the traditional way from milled brown rice using red cedar trays. High quality Lima [from Belgium] or Muramoto sea salt is used in cooking the rice, even though they are at least three times the cost of regular sea salt... Charlie’s Amazuki is made with American organic adzuki beans. The beans are fermented with the rice; this can be tricky since beans sour more easily than grains. I found the Amazuki slightly reminiscent of chocolate milk and enjoyed its unusual flavor.

“Charlie says natto, a soy food, is the best product he makes, ranking high in the world of medicinal foods, along with umeboshi and miso.” A description of the process follows. Photos show: (1) The Kendall’s home and food company. (2) Charlie and Yoko Kendall, and their young son, standing by the Kendall Food Co. sign. (3) Charlie Kendall—up close.

1135. *Toyo Shinpo (Soyfoods News)*. 1986. Haigyôsha wa 1800 sha (59 nendo). Shinki san nyûgyôsha 1100 sha mo. Kôseisho chôsa tôfu seizôgyôsha-sû wa 26,032 [In 1984 in Japan 1,797 tofu companies went out of business and 1,067 started business, for a net decrease of 730. Total number of

tofu companies is 26,032]. April 1. p. 1. [Jap; eng+]

• **Summary:** On average, there was 1 tofu shop for every 4,619 Japanese people. Also, there were 949 natto companies, down 1.86%.

1136. Maeda, Toshiie. 1986. Miso no furusato [The homeland of miso]. Tokyo: Kokon Shoin. 258 p. April. Illust. 20 cm. [124 ref. Jap]

• **Summary:** Contents. 1. The homeland of miso: The birthplace of miso. Cultural factors that gave birth to miso. 2. The paths of dissemination of miso: Southern and northern paths in China. The arrival of miso in Japan and its spread there. History of miso in Japan. 3. The taste and nutritional value of miso: Theories of change in miso. Miso in our lifestyle. 4. Miso as a commercial product: The movement of miso from producer to consumer. The price of miso. Future prospects for miso culture. Present status of changes in miso culture. Explore these new miso products from the principles of changes in miso culture. Proposal for the future of miso culture.

This creative book discusses miso’s history, the present status of the Japanese miso industry, the future of miso in the westernized Japanese diet, and the fact that the use of miso mainly in miso soup presents a big problem. The first solution to the problem is to use miso in thick ketchup-like sauces. The second is to return to the non-salted fermented foods such as Japanese natto, Nepalese kinema, Indonesian tempeh, and Chinese fermented black soybeans (shi), which are the ancestors of miso. He emphasizes tempeh, which he feels is a wonderful food that can be used in various ways, and is nutritious and healthy. He explains that tempeh is becoming popular in the USA and Europe, and concludes that tempeh alone can be used to start a food industry. Address: Sozosei Kaihatsu Kenkyusho Shusai.

1137. Nagami, Yoichi; Tanaka, Teruo. 1986. Molecular cloning and nucleotide sequence of a DNA fragment from *Bacillus natto* that enhances production of extracellular proteases and levansucrase in *Bacillus subtilis*. *J. of Bacteriology* 166(1):20-28. April. [60 ref. Eng]

Address: 1. Central Research Laboratories of Mitsubishi Chemical Industries, Kamoshida, Midoriku, Yokohama-shi, Kanagawa 227; 2. Mitsubishi Kasei Inst. of Life Sciences, Minamiooya, Machida-shi, Tokyo 194. Both: Japan.

1138. Takeyama, Emiko; Fukushima, Masako; Kawarada, Akira; Okamoto, Susumu. 1986. Daizu oyobi daizu kakô shokuhin-chû ni okeru shokubutsu seni ni tsuite [Dietary fiber contents of soybean and soybean foods]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society for Food Science and Technology)* 33(4):263-69. [5 ref. Jap; eng]

• **Summary:** The dietary fiber (DF) content of the following soybean foods were determined by the detergent fiber

method of Van Soest: kinako, natto, akadashi miso, Hatcho miso, and okara. Pectin, the main indigestible polysaccharide of soluble DF, and crude fiber, were also determined. Okara had the highest total DF value. Miso and natto, both fermented foods, were low in hemicellulose and pectin. Kinako was remarkably high in neutral detergent fiber (NDF). Address: Showa Women's Univ., 1-7, Taishido, Setagaya-ku, Tokyo 154, Japan.

1139. Perez, Oswaldo. 1986. La soya en la alimentacion humana [Soya in human nutrition]. *La Era Agricola (Merida, Venezuela)* No. 0. May. p. 14-15. [1 ref. Spa]

• **Summary:** Shows how soya makes most efficient use of the earth's ability to produce protein. Address: Granja Tierra Nueva, Aldea San Luis, La Azulita, C.P. 5102, Estado Merida, Venezuela.

1140. U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Retail Food Protection Branch. 1986. Definitions—Potentially hazardous food (Leaflet). In: Retail Food Protection: Program Information Manual. Washington, DC. Part 6—Inspection. Chap. 01—Code Interpretations. Number 1-102(q). 15 pages. 9 May 1986. [21 ref]

• **Summary:** This is an update, revision, and expansion of similar documents from 1984 and 1985. It contains an update of 1-102 (q)—Soy Protein Products Considered to be Potentially Hazardous Foods (5/23/84). “Question: What are the factors that can be used to determine whether or not a food is potentially hazardous.” Contents: Discussion. “Classification of foods: Foods can be classified into two major categories—animal and plant. There are four logical groups within the animal category: (1) meat and meat products, (2) poultry and eggs, (3) fish and fishery products, and (4) milk and milk products. Likewise there are four groups within the plant category: (1) cereals and cereal products, (2) sugar and sugar products, (3) vegetables and vegetable products, and (4) fruit and fruit products. In addition to the eight groups, there are lesser groups that include products such as spices, flavoring materials, nutmeats and synthetic ingredients. Practically all foods in the animal category are potentially hazardous. That is, they are typically encountered in a form capable of supporting the rapid and progressive growth of infectious or toxigenic microorganisms or the slower growth of *Clostridium botulinum*.” Exceptions are then listed.

“It is the plant products category that causes much of the confusion and uncertainty. These foods are widely believed to be non-potentially hazardous. Yet foodborne illness data clearly establish that such foods are sometimes in a form capable of supporting the rapid and progressive growth of disease organisms or the slower growth of *C. botulinum*... Already interpreted to be potentially hazardous are baked or boiled potatoes and moist soy protein products.”

Evaluation factors: “It is necessary to consider the intrinsic and external factors which affect microbial growth. The intrinsic factors vary by product and include nutrient content, water activity measured as available moisture ( $a_w$ ), hydrogen ion concentration (pH), biological structure, oxidation-reduction potential (Eh), osmotic pressure and natural antimicrobial constituents. The external factors which can influence bacterial growth include but are not limited to temperature, oxygen, time, light and added antimicrobial agents. Also important is the synergistic or competitive interaction of the various microorganisms present in the product.

Nutrient content: Microorganisms, like other living things, need three basic groups of nutrients: (1) Basic chemical elements such as carbon, hydrogen, sulfur, nitrogen, sodium, potassium, calcium, magnesium, and iron; (2) Vitamins such as B-1 (thiamine), B-2 (riboflavin), B-6 (pyridoxine), biotin, pantothenic acid and folic acid; (3) A source of energy. This is usually obtained through the process of oxidizing carbohydrates (glucose, fructose, lactose, sucrose, raffinose, or complex starches) and proteins.

Water Activity ( $a_w$ ): This is an index of the available moisture in a food. It is defined as the ratio of water vapor pressure of a food to the vapor pressure of pure water at the same temperature. Water would, therefore have a water activity of 1.000. Each microorganism has an optimum and a minimum water activity for growth. The minimum ranges from 0.86 for *Staphylococcus aureus* to 0.96 *Pseudomonas aeruginosa*. Fresh meat, poultry, fish, and tofu typically have a water value of 0.99 or greater. FDA and USDA consider foods with a water activity of 0.85 or below to be not potentially hazardous.

Hydrogen ion concentration (pH): Most microorganisms grow best at a pH between 6.6–7.5. Each microorganism has a maximum, and optimum, and a minimum pH at which it will grow. The minimum (acidic) is about 4.0 (for *Staphylococcus aureus* and *Salmonella*). The FDA and USDA have established 4.6 as the level at or below which foods should not be considered potentially hazardous. The maximum (alkaline) is about 10.0 for *Bacillus subtilis*. [Note: The pH of fresh tofu is typically 6.5-7.5].

Biological structure: “One fresh plant food has historically been associated with foodborne illness—seed sprouts. Germinated soybeans have caused illness due to contamination with *Bacillus cereus*. The more commonly encountered sprouts—mung beans and alfalfa—have been shown to support the growth of both *Salmonella sp.* and *Yersinia enterocolitica*... Many foods in the plant category have caused foodborne illness outbreaks after heating. Some examples are: Bean curd (tofu)—*Yersinia enterocolitica*.”

Other intrinsic factors. External factors. Interaction of intrinsic and external factors. Measuring water activity and pH. Measuring other factors. Redefinition: “Based on the information in this and related interpretations, it seems



appropriate to redefine the term potentially hazardous food as follows: 'Potentially hazardous food' means any food or food ingredient, natural or synthetic, in a *form* capable of supporting (1) the rapid and progressive growth of infectious or toxigenic microorganisms or (2) the slower growth of *C. botulinum*."

Interpretation. Note. References. Address: 200 C Street S.W., HFF-342, Washington, DC 20204. Phone: 202-485-0140.

1141. *Toyo Shinpo (Soyfoods News)*, 1986. Tenpe kaihatsu no jigyo. Zen Nôren. Gyôkai no takakuka to kasseika e [Tempeh project development report from Japan Natto Association. To make the industry more versatile and active. Second generation products are hoped for]. June 21. p. 9. [Jap; eng+] • **Summary:** The techniques of making tempeh are already well established. The water content and cracking/dehulling the beans are the two key subjects. This report was presented to Japan's Department of Agriculture (*Nosuisho*) in April 1985 by the Japan Natto Assoc. The total budget was 18.1 million yen (\$80,000). The project was done at Takashin Shokuhin Ltd. in Tokyo. Members of the research project were Goro KANASUGI and Haruo NITTA (President of Teito Shokuhin KK), Mitsuki YAMANAKA (Head of Takashin Research Lab.). Head researcher was Makio TAKATO (President, Takashin). Address: Kyoto, Japan.

1142. Belleme, Jan; Belleme, John. 1986. *Cooking with Japanese foods: A guide to the traditional natural foods of Japan*. East West Health Books, 17 Station St., Brookline, MA 02146. xi + 220 p. Illust. Index. 25 cm. [45 ref] • **Summary:** A good study from a macrobiotic viewpoint, with more than 200 macrobiotic recipes. The authors studied in Japan and speak Japanese. Contents: Foreword. Acknowledgements. Introduction. Fermented Foods: miso, shoyu, tamari, brown rice vinegar, sake, mirin, koji, amazake, pickles, umeboshi, ume su, medicinal teas, ume extract, bonito flakes, natto. Noodles: cooking noodles, udon, soba, somen, clear noodles. Grains, incl. rice, mochi, seitan, fu gluten cakes, hatomugi [*hatomugi*] (Job's tears), rice syrup, rice bran. Vegetables: shiitake, daikon, Hokkaido pumpkin, Chinese cabbage, burdock, jinenjo, lotus root. Sea vegetables: kombu, nori, wakame, hijiki and arame, kanten (agar). Beans: azuki beans, black soybeans, tofu. Condiments: kuzu, dark (toasted) sesame oil, goma (sesame seeds), tekka, shiso momiji (shiso leaf condiment), wasabi. Teas. Cooking utensils. Appendix: Composing meals, pronunciation guide, suppliers. Bibliography.

Amazake (p. 39-45). Contains a 1/2 page description plus good instructions for making basic amazake (thick "pudding" and thinner beverage), both from glutinous ("sweet") rice. Also recipes for Vanilla Amazake Pudding, Amazake Cream Puffs, Neapolitan Parfait, Carob Amazake Brownies, Bob's Coconut Amazake Macarons, Amazake Bread (yeasted),

and Unyeasted Amazake Bread. Perhaps the most lengthy information on amazake available in English up to this time.

*Hato mugi* ("Job's tears," p. 93) "resembles barley, but it is actually a member of the rice family. An easily digestible whole grain with only the tough outer husk removed, hatomugi contains less vitamin B-1 than brown rice but approximately twice as much protein, iron, vitamin B-2, fat, and slightly more calcium." It has long been used in China and Japan as a medicinal food, "for strengthening the stomach, purifying the blood, and restoring health. Since it is so effective in helping the body to discharge toxins, people who are sick and weak, and women who are pregnant, nursing a baby, or menstruating should eat it sparingly." Address: Rutherfordton, North Carolina.

1143. Hara, Toshio; Chetanachit, Charan; Fujio, Y.; Ueda, S. 1986. Distribution of plasmids in polyglutamate-producing *Bacillus* strains isolated from "natto"-like fermented soybeans: "thua nao," in Thailand. *J. of General and Applied Microbiology (Tokyo)* 32(3):241-49. June. [25 ref]

• **Summary:** "Four polyglutamate (PGA)-producing *Bacillus* strains were isolated from 'thua nao' in Thailand. Three of these did not require biotin for growth. All four produced high activities of gamma-glutamyltranspeptidase (gamma-GTP). Each of these strains carried a single plasmid species."

"Apparently a 'natto' plasmid is distributed widely in PGA-producing *Bacillus*." It may have developed from a common ancestral molecule. "Therefore, the distribution of 'natto' plasmids in PGA-producing *Bacillus* strains may help to distinguish *B. subtilis* from *B. subtilis* (*natto*).

Thua nao is a traditional fermented soyfood in northern Thailand. It is produced by aerobic spore-forming rods, similar to the natto *Bacillus*, growing on steamed soybeans. "It is an adhesive fermented" soyfood with a noticeable odor of ammonia, "and so is considered to be the same as Japanese 'natto'" (S. Nakao 1972, *Ryori no Kigen*, p. 121). Address: 1. Dep. of Food Science & Technology, Faculty of Agriculture, Kyushu Univ., Hakozaki, Fukuoka 812, Japan; 2. Dep. of Microbiology, Faculty of Science, Kasetsart Univ., Bangkok 10210, Thailand; 3. Dep. of Applied Microbial Technology, Kumamoto Inst. of Technology, Ikeda, Kumamoto 860, Japan.

1144. Inooka, S.; Uehara, S.; Kimura, M. 1986. The effect of *Bacillus natto* on the T and B lymphocytes from spleens of feeding chickens. *Poultry Science* 65(6):1217-19. June. [6 ref. Eng]

• **Summary:** *Bacillus natto* is isolated from the fermented soyfood natto and used in Japan in a preparation that enhances the growth of farm animals; thus it is a kind of nutritional supplement or growth enhancer. Address: 1-2. Dep. of Animal Science, Faculty of Agriculture, Tohoku Univ., 1-1 Amamiyamachi Tsutsumidori, Sendai 980, Japan.

1145. *Toyo Shinpo (Soyfoods News)*, 1986. Ryôri no barieishon: Nattôiri teppanyaki [Cooking variations: Pancakes grilled on a flat iron with natto added]. Aug. 21. [Jap]

• **Summary:** The variations are Oyaki, Okonomi-yaki, and Western-style pancakes. A photo shows all of them.

1146. Boon-Long, Narudom. 1986. Traditional technologies of Thailand: Traditional fermented food products. In: V.H. Potty, et al. eds. 1986. *Traditional Foods: Some Products and Technologies*. 292 p. See p. 114-33. Aug. Presented at the UN University Workshop on "Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies." Held June 1983 at CFTRI, Mysore, India. [23 ref]

• **Summary:** "Products such as soy sauce, soy paste (*Tao-Jeow*), fermented soybean curd [Sufu] and *Thua-nao* constitute the major traditional fermented foods [of Thailand]. The first three are common throughout the country. *Thua-nao* is popular in northern Thailand." Flowcharts and details are given concerning the production of each of these products. Address: Dep. of Food Science & Technology, Kasetsart Univ., Bangkok, Thailand.

1147. Ho, C.C.; Ten, S.K.; Chuah, B.H.; Lee, G.S.; Kok, C.H.; Chen, Y.F. 1986. Microbiology of traditional fermented food in Malaysia and surrounding countries. In: V.H. Potty, et al. eds. 1986. *Traditional Foods: Some Products and Technologies*. 292 p. See p. 134-35. Aug. Presented at the UN University Workshop on "Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies." Held June 1983 at CFTRI, Mysore, India.

• **Summary:** "Soy sauce, tempeh, ontjom, tapai and ubi are the fermented foods on which laboratory studies and extensive field work have been carried out in Malaysia. Tempeh and tapai are traditional fermented foods of Malaya and also the Indonesians. Soy sauce manufacture is the largest fermentation industry in Malaysia, technology for which was introduced by the Chinese..."

"Offensive odour development in the fermentation process results in spoilage of tempeh and tapai. *Bacillus subtilis* causes this problem. A strain of *B. subtilis* (H4052) has been isolated. It has been found that it inhibits the growth of *Rhizopus oligosporus* and *R. oryzae* through the likely production of antimycotic antibiotics." Address: Univ. of Malaya, Kuala Lumpur, Malaysia.

1148. Karki, Tika. 1986. Some Nepalese fermented foods and beverages. In: V.H. Potty, et al. eds. 1986. *Traditional Foods: Some Products and Technologies*. 292 p. See p. 84-96. Aug. Presented at the UN University Workshop on "Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies." Held

June 1983 at CFTRI, Mysore, India. [4 ref]

• **Summary:** Table 2 notes that kinema is made by a bacterial fermentation of soybeans. No details are given. Address: Central Food Research Lab., Kathmandu, Nepal.

1149. Koleoso, O.A.; Kuboye, A.O. 1986. Traditional food, beverage and technology of Nigeria and other West African countries. In: V.H. Potty, et al. eds. 1986. *Traditional Foods: Some Products and Technologies*. 292 p. See p. 13-28. Aug. Presented at the UN University Workshop on "Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies." Held June 1983 at CFTRI, Mysore, India. [14 ref]

• **Summary:** Page 16 discusses *Iru* (a Yoruba word), called *Dorowa* in Hausa or *Ogin-Igala* in Igbo or Ibo. It is a food condiment prepared by fermenting the dried seeds of the African Locust Bean tree (*Parkinsonia clappertoniana*) which is abundant in the Savannah areas of Nigeria. It is widely used in Nigeria for preparing vegetable soups and stews. The dried Locust Bean seeds are cooked under pressure for 30-60 minutes. The seedcoats are removed and the process is repeated for 30 minutes. The softened seeds are cleaned under running water. They are then fermented naturally in a calabash covered with muslin cloth. The *Iru* is ready for sale in 3-5 days.

Page 19 discusses soy ogi (made from maize and soybeans). The microorganisms isolated from soy ogi are: *Saccharomyces cerevisiae*, *Candida mycoderma*, *Lactobacillus plantarum*, and *Aerobacter cloacae*. Also discusses the organisms isolated from cassava-based gari, fufu, and lafun. Address: Federal Inst. of Industrial Research, Oshodi, Nigeria.

1150. Lee, Cherl-Ho. 1986. Traditional food technologies and their recent developments in Korea. In: V.H. Potty, et al. eds. 1986. *Traditional Foods: Some Products and Technologies*. 292 p. See p. 178-90. Aug. Presented at the UN University Workshop on "Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies." Held June 1983 at CFTRI, Mysore, India. [14 ref]

• **Summary:** The traditional Korean soybean fermentation technique is unique. Soybean is the only ingredient used, and sauce and paste are made simultaneously. In the first step of the fermentation, meju is made from cooked and mashed soybean balls, which contain no salt. Molds, mainly *Aspergillus oryzae*, grow on the surface of a meju ball, and bacteria, mainly *E. [sic, Bacillus] subtilis*, inhabit the inside of the ball. One part of meju, one part of salt, and 4 parts of water are mixed in earthen jars, and ripened for several months. The supernatant dark brown liquid of meju-brine mixture is soybean sauce and the brownish solid residue is soybean paste.

Kochujang, a mixture of fermented soybean paste and

ground red pepper, is a unique food product available only in Korea; it reflects the hot spice preference of its people. It is prepared by mixing ground meju powder with steamed cereal flour, red pepper, salt and water and allowing further fermentation and ripening of the mixture in earthen jars for several months. Flowcharts are given for soy sauce, soy paste, and kochujang.

Under “Recent developments” (p. 187), the development of improved meju and meju-brine are discussed. Address: Dep. of Food Technology, Korea Univ., Seoul, Korea.

1151. Odunfa, S. Ayo. 1986. Fermented vegetable proteins of Nigeria. In: V.H. Potty, et al. eds. 1986. Traditional Foods: Some Products and Technologies. 292 p. See p. 7-12. Aug. Presented at the UN University Workshop on “Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies.” Held June 1983 at CFTRI, Mysore, India. [11 ref]

• **Summary:** Gives a detailed discussion of iru (dawadawa), which is by far the most important food condiment in Nigeria and many countries of West and Central Africa. It is prepared from the seeds of the African Locust Bean, which is not normally used as a food in its natural state. The seeds are fermented naturally for 3-5 days with *Bacillus subtilis* in a calabash covered with muslin cloth. Then the resulting product is used to season vegetable soups and stews. Details of the fermentation process are given. Address: Dep. of Botany, Univ. of Ibadan, Ibadan, Nigeria.

1152. Potty, V.H.; Shankar, J.V.; Ranganath, K.A.; et al. eds. 1986. Traditional foods: Some products and technologies. Mysore, India: Central Food Technological Research Inst. (CFTRI). 292 p. Aug. Papers presented at the UN University Workshop on “Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies” held June 1983 at CFTRI, Mysore. 25 cm.

• **Summary:** This publication contains 27 papers presented by scientists from countries of Asia, Africa, Europe, and the Americas. Chapters related to soy are cited separately. The traditional foods of the following countries are discussed specifically: Ethiopia, Nigeria\*, Sudan, Senegal, Pakistan\*, India, Nepal\*, Burma\*, Thailand\*, Malaysia\*, Indonesia\*, Philippines, Korea\*, China\*, Japan\*, and Mexico\*. Countries with foods related to soy are followed by an asterisk (\*). Address: Central Food Technological Research Inst. (CFTRI), Mysore-570 013, India.

1153. Watanabe, Tokuji. 1986. Traditional foods: Their values, problems and research and development. In: V.H. Potty, et al. eds. 1986. Traditional Foods: Some Products and Technologies. 292 p. See p. 201-08. Aug. Presented at the UN University Workshop on “Traditional Food Technologies: Their Development and Integrated Utilisation with Emerging Technologies.” Held June 1983 at CFTRI,

Mysore, India. [7 ref]

• **Summary:** Contents: Introduction (ways of classifying traditional foods). Structural characteristics of traditional food industries in Japan. Traditional food processing technologies. Problems and reevaluation of traditional foods. New food processing technologies applied to traditional foods. Technologies applicable to traditional foods. Assessment in modernization of traditional food production. Some activities related to traditional foods. Conclusion.

Traditional foods can be classified as staple or non-staple, fresh or processed (processing technologies include fermentation [e.g. miso, soy sauce, natto], salting, acidifying, drying after freezing [kori-tofu], sun-drying, fractionation [tofu], fabrication [ganmodoki], simulation of animal foods [soy milk, ganmodoki, su-ho-tai made from yuba in China]), animal or vegetable origin, and region or national production.

In Japan, rice consumption is decreasing year after year. It is thus not surprising that consumption of traditional foods closely associated with rice production are also decreasing. The reevaluation of traditional foods and their advantages and disadvantages are discussed. New food processing and packaging technologies are being applied to traditional foods, including tofu, miso, natto, and koji. Recently a method has been found to extend the shelf life of natto beyond the traditional 1-2 day period. Miso has been freeze-dried.

“Another application of a new process for the traditional foods is the emulsion curd which is a semi-solid mixture with definite proportion of soybean protein, oil and water. It keeps its form without flow. Even the dried or frozen product recovers its original texture by hydration or thawing. Therefore, it is used as a substitute in dried or frozen *Tofu*. Regular *Tofu* cannot recover its texture once it is frozen or dried...

Miso can be enriched with vitamin B-2 and calcium, and its salt content lowered. Since 1980 the Laboratory of Food Science at Kyoritsu Women’s University has been conducting a research survey on traditional foods and dishes in Japan in cooperation with the Cooking Research Laboratory. “This project consists of three components: (a) survey of the present status of traditional foods on local basis at respective regions by visiting prefectural research organisations—universities and colleges; (b) sending questionnaires to students for seeking information on the position of the traditional foods in the dietary patterns of individual homes and also to obtain their comments on the future prospects of the local traditional foods; (c) and documentation regarding local traditional foods, followed by classification according to preparation or cooking method for analysis. On the basis of the collected data, the relationship between each local traditional food and its natural, cultural and historical background has been studied and published in the university’s journals. More efforts are being made

to identify the reasons as to why and how some traditional foods have survived in certain regions, while the others have disappeared or reached the verge of extinction.

“Another related activity is the one carried out by Ajinomoto Company, a major food manufacturer in Japan, which has got the modern audio-visual media, video-tapes and 36 mm-films. Their team has been documenting the processing of some selected traditional foods like *Tofu*, *Yuba*, *Fu* and such other foods as demonstrated by professionals by using the old traditional methods and facilities. This would help in the documentation of traditional technologies before they disappear in the event of modernisation of such foods. Such tapes and films have been made available by the company...

“Traditional foods, especially those of plant origin, are prepared by such complex multi-step processes as to be called ‘products of human wisdom.’ Therefore there is so much to learn from such products if serious attention be paid. Indeed they have great potential for developing new food industries.” Address: Kyoritsu Women’s Univ., Tokyo, Japan.

1154. Arocena, Javier. 1986. Re: Brief history of the soyfoods company Zuaizto in Spain. Letter to William Shurtleff at Soyfoods Center, Sept. 10. 2 p. Typed, without signature on letterhead. [Eng]

• **Summary:** “I’ve been working for the last 4 years making tofu, seitan, and tempeh, in a craftsman way, in the North of Spain, in the Basque country. Unfortunately in all of Spain we are only two people making those kind of products, even if slowly, slowly, people are asking us more and more for them every day. I have graduated in biology, and so have a background in what I am doing. I’ve really found myself useful for the rest of the world, and enjoy my life and work... I’d like to ask if there is any possibility of working for a short time (a summer or a month) in a place where I could learn how to make miso, tamari, natto, sufu, and soynuts.” Address: Zuaizto, Correria, 39–01001 Vitoria-Gasteiz, Spain. Phone: 945/28 86 30.

1155. Fukushima, Danji. 1986. New development in the process of traditional soyfoods in Japan. In: F.G. Winarno, ed. 1986. International Soyfoods Symposium. xiv + 403 p. See p. 21-57. Held 16-18 Sept. 1986 in Jogjakarta, Indonesia. [22 ref]

• **Summary:** Contents: Abstract. Soy milk. Tofu. Soy sauce. Miso. Natto.

Table 1 (p. 28) shows changes in the size of the soymilk market in Japan from 1979 to 1985. For each year there are statistics for the amount of soymilk sold (in kiloliters), the ratio of that amount to the amount sold during the previous year, the total retail value in yen, the ratio of the retail value that year to the value the previous year, and the ratio of the retail value that year to the value in 1979. The amount of soymilk sold in million liters is as follows: 1979–6.5 million

liters. 1980–12.0. 1981–25.2. 1982–54.3. 1983–111.5. 1984–84.013. 1986–55.354.

Also contains a detailed analyses of the off-flavors in soymilk. These off flavors are brought about through the hydrolysis of the glycosides by the Beta-glycosidase contained in soybeans. Contains 46 figures, including many photos, flowcharts, and equipment designs. Address: Food Research Inst., Kikkoman Co. Ltd., 339 Noda, Noda City, Chiba prefecture, Japan.

1156. Hara, Toshio; Ishizaki, A.; Ueda, S. 1986. Formation of heteroduplex molecules between plasmids pUH1 and pLS11 in polyglutamate-producing *Bacillus* strains: Note. *Agricultural and Biological Chemistry* 50(9):2391-94. Sept. [15 ref]

• **Summary:** The main component in the viscous material on the surface of natto is gamma polyglutamate (gamma-PGA), which contains D- and L-glutamate in varying proportions. “A plausible mechanism for the biosynthetic pathway for PGA has been proposed by Thorne et al.” (1955a & b) for another species of *Bacillus*.

Photos show: (1) Agarose Gel Electrophoresis of Digests of pLS11 with Lanes 1-4. (2) Hybridization patterns. (3) Heteroduplex molecules between pUH1 and pLS11.

Illustrations show: (1) A circular restriction map and regions of homology of pLS11. (2) An interpretation of the measurements in photo (3). Address: 1-2. Dep. of Food Science & Technology, Faculty of Agriculture, Kyushu Univ., Hakozaki, Fukuoka 812, Japan; 3. Dep. of Applied Microbial Technology, Kumamoto Inst. of Technology, Ikeda, Kumamoto 860, Japan.

1157. Popoola, T.O.S.; Akueshi, C.O. 1986. Nutritional evaluation of daddawa, a local spice made from soybean (*Glycine max*). *World Journal of Microbiology and Biotechnology* 2(3):405-09. Sept. \* Address: Dep. of Botany, Univ. of Jos, Jos, Nigeria.

1158. **Product Name:** [Natto].

**Foreign Name:** Natto.

**Manufacturer’s Name:** Sojvita Produktions GmbH.

**Manufacturer’s Address:** Hauptplatz 1, 2493 Lichtenwoerth, Austria. Phone: 02622/75494.

**Date of Introduction:** 1986. September.

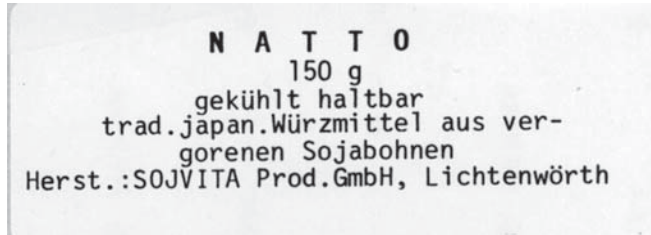
**Ingredients:** Vergorenen Sojabohnen.

**Wt/Vol., Packaging, Price:** 150 gm.

**How Stored:** Refrigerated.

**New Product–Documentation:** Letter from Norbert Brunthaler. 1988. Jan. 4. Gives date of introduction as September 1986. Label. 1987. 3.5 by 1.5 inches. Black typed letters on white. Pressure sensitive label. See next page.

1159. *Toyo Shinpo (Soyfoods News)*, 1986. Zenkoku shuyô toshi no tôfu seihin nenkan kônyû kingaku [Annual amount



and value of tofu consumed per household in Japan, by cities]. Oct. 21. p. 1-2. [Jap; eng+]

• **Summary:** In 1985 the average household bought 88.5 cakes of tofu costing 7,337 yen. The average price/cake was 79.6 yen. Compared with 1970 the number of cakes rose 0.5%, the amount spent rose 3.05-fold, and the cost of one cake rose 2.88 fold. In 1985, of the total money spent on soyfoods per household (13,435 yen), 58% was spent on regular tofu, 30.2% on fried tofu (pouches and burgers), 12.3% on natto, and 2.8% on other soyfoods. Cities with the highest consumption of tofu per household are Morioka (122.7 cakes), Toyama (115.7), Kagoshima (105.1), Kokushima (105.0), Tottori (102.3). Tokyo is in 29th place with 87.5 cakes.

In 1985, foods with the fastest growing consumption per household compared with 1970 were: coffee and cocoa +116.6%, prepared foods +63.9%, processed meats 47.0%, raw meats 35.4%, foods eaten away from home +34.6% and oils/fats +34.5%. Those decreasing the most rapidly are: rice -34.3%, processed seafoods (e.g. kamaboko) -29.0%, fresh fish and shellfish -21.1%, eggs -13.4%, milk -10%, soyfoods -3.7%.

1160. *Toyo Shinpo (Soyfoods News)*. 1986. Kenko imeeji-do besuto 20. 6 i ni nattô, 11 i ni tôfu [The 20 Japanese foods with the healthiest image. Natto is 6th and tofu is 11th]. Oct. 21. p. 1-2. [Jap; eng+]

• **Summary:** The healthy image ranking, based on a survey of 1,000 households in October 1985. Conducted by Shokuhin Sangyo Center in Tokyo (Toranomon. Tel. 03-591-7451) and titled "Health and Food." 1. Sardines (340 points out of a possible 1,000), 2. Shirasu (the young of sardines, 298), 3. Process cheese (259), 4. Real fruit juice (241), 5. Umeboshi salt plums (227), 6. Natto (227), 7. Natural cheese (225), 8. Brown rice (218), 9. Honey (210), 10. Tofu (204), 11. Wakame (sea vegetable, 197), 12. Soymilk (196), 13. Yogurt (193), 14. Sesame oil (181), 15. Konnyaku (180), 16. Cow's milk (180), etc.

1161. Burum, Linda. 1986. Breakfast in Chinatown and other Asian spots. *Los Angeles Times*. Nov. 16. p. S106.

• **Summary:** The section titled "Japanese" begins: "Amid the jangle of downtown traffic, A Thousand Cranes is an oasis of flagging civility." This lovely, calm restaurant, with its own stylized Japanese garden, is in the New Otani Hotel, at 120 S. Los Angeles St., Los Angeles. Dressed in a classical

kimono, the waitress brings breakfast on a lacquered tray. On it is a covered bowl of miso soup, plus rice and other delicacies. "One may select from several other *okazu* (the things to eat with rice) such as squares of delectably garnished and very fresh *tofu* or *natto*, a little mound of flavorful fermented bean" [sic, beans].

"A jar of *umeboshi*, the mouth puckering tiny sour plums known as nature's own mouthwash, is placed on each table; one of these cleanses the palate."

The section titled "Chinese" begins with a visit to Yi Mei, a very good traditional Chinese bakery in Monterey Park (near downtown Los Angeles), known for its "Northern-style breakfasts centering on large bowls of soy milk that may be ordered slightly sweetened or seasoned with a dash of sesame oil and salt. Look around and watch everyone dipping *yu t'iao*, long, airy fried buns that resemble unsweetened crullers, into their soy milk." The crullers soak up the soy milk, then everyone noisily (its impossible to do this quietly) eats the crullers.

1162. Barrett, Mariclaire. 1986. The cook's glossary of soyfoods. *Vegetarian Times*. Nov. p. 28-35. [10 ref]

• **Summary:** Gives good definitions, with a full-page color illustration by Emily Soltanoff, of: Soybeans, soynuts, soy flour and grits, soy oil, textured vegetable protein, soymilk, okara ("the pulp that remains after the soymilk has been strained"), soy yogurt and soy cheese, tofu, fermented soyfoods, tempeh, miso, natto, soy sauce.

The article begins: "For 60 seconds on a national television commercial, a small, round soybean rolls past a lineup of infant formula, bread, pizza, chili, salad dressing, ice cream [Tofutti], soymilk and cubes of tofu; meanwhile the narrator intones, 'The newest development in nutrition is actually one of the oldest foods known to man.' Through advertising, the concept of soyfoods is brought home to millions of Americans by the soy giant, Archer-Daniels-Midland Company." Address: Staff.

1163. Kawabata, Makoto; Taguchi, Kuniko; Ohtsuki, Kozo. 1986. Okara o shokuryo toshita nattô oyobi tenpe no shokuhin kagaku [Food chemical evaluation of fermented okara products, okara-natto and okara-tempeh]. *Kyoto Furitsu Daigaku Gakujutsu Hokoku (The Scientific Reports of the Kyoto Prefectural University (Natural Science and Living Science))* 37(Series B):9-15. Nov. (Chem. Abst. 107:38312). [13 ref. Jap; eng]

• **Summary:** Okara, a residue of water-extracted ground soybeans, is produced in large amounts as a by-product of commercial production of tofu and soymilk. Although it contains a large amount of dietary fiber plus 4.8% high quality protein, it has a poor taste and rough texture, and is relatively indigestible.

In this study, natto and tempeh were prepared from okara by fermentation with *Bacillus subtilis* (*natto*) and

*Rhizopus oligosporus* (or *R. oryzae*).

Natto is a sticky paste with the characteristic flavor and odor of natto. Okara tempeh has a sausage-like texture, bound together by the fragrant white *Rhizopus* mycelium, which also covers its surface. Because of its good, bland flavor and because of its high content of dietary fiber, it can be fried in oil and used as a fiber-rich food; powdered or minced tempeh can be used to add fiber to cookies, bread, muffins, etc.

The riboflavin content of both products rose dramatically during fermentation; 33.1 times for okara natto and 32.7 times for okara tempeh. Vitamin B-6 also increased in both foods. Address: Lab. of Food Chemistry, Dep. of Food Science, Kyoto Prefectural Univ. [Japan].

1164. Mebrahtu, S.; Hahn, N.D. 1986. "Dawadawa": An indigenous soybean processing. Paper presented at the Seminar on the Nigerian Food Culture, Institute of African Studies, University of Ibadan. Held 26-28 Nov. 1986. \*

1165. Aida, Kô; Ueda, Seinosuke; Murata, Kiku; Watanabe, Tadao. eds. 1986. *Ajia no muen hakkô daizu shokuhin* [Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation]. Japan: Takeshima Shigeru. 319 p. Held July 1985 in Tsukuba, Japan. Illust. (some color). No index. 27 cm. [400 ref. Eng; Jap]

• **Summary:** A pioneering symposium featuring tempeh and natto. About 70% of the book is in English and 30% in Japanese. A number of chapters are in Japanese with no English translations. Contains many typographical errors in the English sections.

Those interested in the early history of natto and other East-Asian fermented foods will find the discussion (in Japanese) on pages 174-78 to be very interesting. Address: Tsukuba, Japan.

1166. Asano, Machiko. 1986. *Nihonjin no nattô, tenpe ni taisuru shikô chôsa* [Survey of Japanese acceptance of natto and tempeh using taste tests]. In: Kô Aida, et al. eds. 1986. *Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation*. Japan: Takeshima Shigeru. 319 p. See p. 285-90. Held July 1985 at Tsukuba, Japan. English-language summary in *Symposium Abstracts*, p. 79. [Jap]

• **Summary:** Percentage of people in different age groups who say they like natto/tempeh: Students (36.4/4.2), age 20-29 (39.5/15.8), age 30-39 (58.2/32.9), age 40-49 (61.3/38.7), age 50-59 (63.9/33.7), age 60+ (62.5/56.3). Also compares likes and dislikes by region. Address: Teikoku Joshi Daigaku.

1167. Fujii, Hisao. 1986. *Nattô no nenshitsu-butsumi, nioi, fureebaa to bisei-butsumi* [Microbial formation of mucilaginous compounds, odor, flavor, and microorganisms in natto]. In: Kô Aida, et al. eds. 1986. *Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation*. Japan:

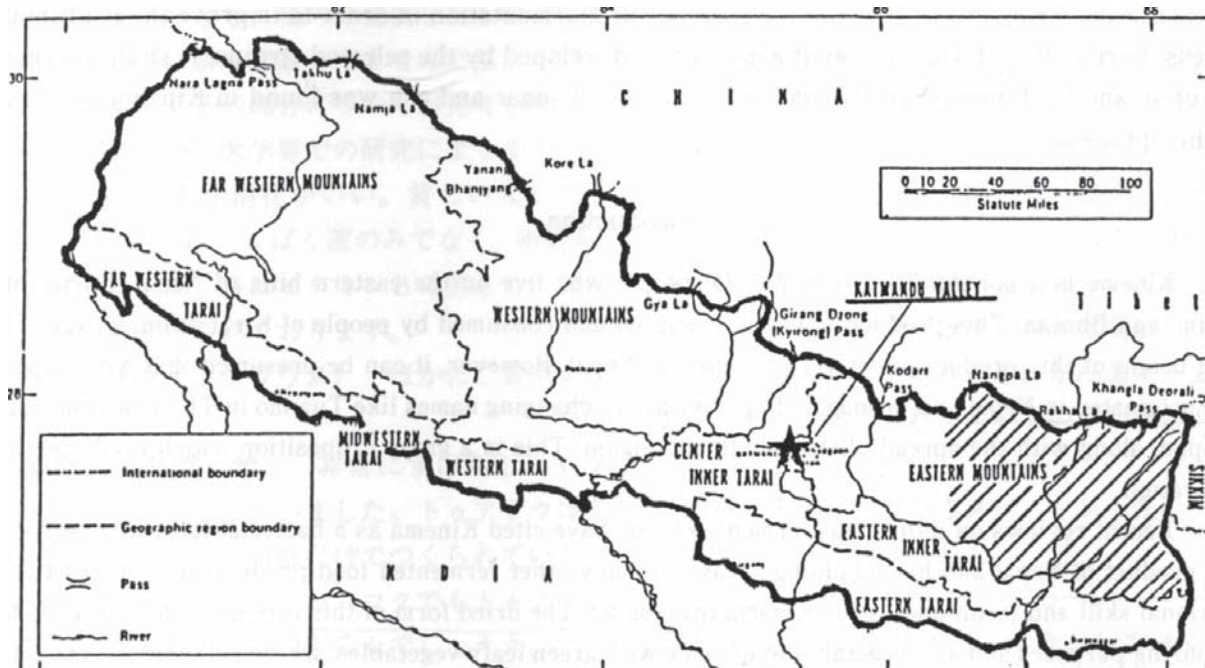
Takeshima Shigeru. 319 p. See p. 219-33. Held July 1985 at Tsukuba, Japan. English-language summary in *Symposium Abstracts*, p. 70. [35 ref. Jap]

• **Summary:** Tables and figures in English include: Properties of *Bacillus natto* Sawamura. Mucilage produced from various beans. Mucilage produced from parts of soybean. Separation of natto mucilage. Analysis of natto mucilage. Effect of nitrogen on the growth and mucilage formation by *B. natto*. Effect of amino acid on growth and stringy slimy production. Effect of nitrogen source on slime composition. Amino acid composition per 100 gm edible portion of pulses. Hydrolytic products of polyamine derivatives of gamma and alpha linked peptides. Possible scheme for origin of PGA by enzymes found in *B. subtilis*. Effect of optical isomers of glutamine and glutamic acid on transamidase obtained from *B. natto*. Phage host range against the parental and cured strains, and representative transformants. Levan synthesis by levansucrase of *Aerobacter levanicum*.

Effect of medium composition of viscosity of mucilage. Viscosity of polyglutamate and levan. Soybean carbohydrates. Effect of sucrose on mucilage stability. Detection of phage from natto products. Inhibition of natto mucilage formation by added phage. PGA-digesting activity of phage lysate. Change of nitrogen compounds during fermentation. Liberation percentage of amino acids in raw and steamed soybeans, and products fermented 8 or 16 hours. Distribution of Tetramethylpyrazine (TMP) in Japanese fermented foodstuffs (miso is highest). Address: Fukuoka Joshi Daigaku.

1168. Haytowitz, David B.; Matthews, Ruth H. 1986. *Composition of foods: Legumes and legume products*. Raw, processed, prepared. *USDA Human Nutrition Information Service, Agriculture Handbook* No. 8-16. 156 p. Dec. See p. 126-152. By Nutrition Monitoring Division. [29 ref]

• **Summary:** Data are presented for 133 legumes and legume products. Of these, only 53 were included in *USDA Agriculture Handbook* No. 8, published in 1963. The following soy-based foods are included: Simulated meat products (bacon, meat extender, and sausage), raw soybeans, cooked boiled soybeans, roasted soybeans, dry-roasted soybeans, soybean products: miso, natto, tempeh, full-fat soy flour (raw, and roasted), defatted soy flour, low-fat soy flour, defatted raw soy meal, fluid soy milk, soy protein concentrate, soy protein isolate, soy sauce (shoyu, tamari, and HVP), raw tofu (firm {p. 147}, regular, dried-frozen/koyadofu, and fried) [Note 1. Tofu is called "tofu" and at "Soybean curd" it says, see "tofu." Note 2. Footnote 2 states that the calcium content of tofu curded with calcium sulfate is 683 mg/100 gm, compared with 205 mg/100 gm for tofu curded with nigari. As of May 1997 Soyfoods Center believes that both these values are far too high; the two figures should be about 159 mg/100 gm (range 128-168) and 45 mg/100 gm respectively], okara, salted and fermented



tofu (fuyu).

For each food the following information and number of values are given: Vertically: Proximate (7 values), Minerals (9), Vitamins (9), Lipids (Fatty Acids [Saturated (9), Monounsaturated (5), Polyunsaturated (7)], Cholesterol, Phytosterols), Amino acids (18). Horizontally: Amount in 100 gm edible portion (mean, standard error, number of samples), amount in edible portion of common measures of food (e.g.  $\frac{1}{2}$  cup or 1 cup), amount in edible portion of 1 lb of food as purchased.

Minerals include calcium, iron, magnesium, phosphorous, potassium, sodium, zinc, copper, and manganese (not aluminum).

Vitamins include ascorbic acid, thiamin, riboflavin, niacin, pantothenic acid, vitamin B-6, folacin, vitamin B-12, vitamin A.

Amino acids include tryptophan, threonine, isoleucine, leucine, lysine, methionine, cystine, phenylalanine, tyrosine, valine, arginine, histidine, alanine, aspartic acid, glutamic acid, glycine, proline, and serine.

For Adzuki beans (raw, cooked boiled, canned sweetened, and Yokan {yôkan–sugar-sweetened confection}) see p. 24-27.

For peanuts (all types raw, cooked boiled, oil-roasted, dry-roasted, Spanish raw, Spanish oil-roasted, Valencia raw, Valencia oil-roasted, Virginia raw, Valencia oil-roasted) see p. 109-18. For peanut butter (chunk style, smooth style), defatted peanut, and low-fat peanut flour, see p. 119-22. Address: USDA Human Nutrition Information Service.

1169. Karki, Tika. 1986. Microbiology of kinema. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima

Shigeru. 319 p. See p. 39-49. Held July 1985 at Tsukuba, Japan. [Eng; Jap]

• **Summary:** The best publication seen on Kinema up to this time. Kinema is a traditional, non-salted fermented soybean food product widely consumed by the Kirat ethnic population of the eastern hills of Nepal, and into Darjeeling and Sikkim. This product, thought to have originated in Nepal, greatly resembles natto of Japan and thua-nao of Thailand. It is usually produced during the winter; dried kinema is used mainly for flavoring purposes. It is consumed in soup along with green vegetables. There is good potential for expanding the production of soybeans in Nepal. In most of the hilly areas, soybeans are grown as a mixed crop with maize, yet it is only in the far eastern part of Nepal that they are used to make kinema. The dominant organism in this fermentation was found to be *Bacillus subtilis*.

To make kinema in the traditional way, soybeans are washed, soaked overnight, boiled until softened, cracked by pounding lightly, and mixed thoroughly by hand with about 0.5% ash. It is then fermented overnight in bamboo baskets covered with banana leaves at about 25°C. The fresh kinema is then sun dried for about 3 days and stored for 6 months to yield dried kinema. The typical composition is moisture 8.9%, protein 46.2%, fat 18.1%, ash 5.2%. Kinema is less sticky than natto and possesses some acidity.

Tables: (1) Different types of kinema collected from different localities in Nepal. (2) Chemical composition of Kinema.

Figures: (1) An excellent map of Nepal shows the "Kinema producing area of Nepal"—which is in the northeastern part of the country. (2) Flow chart—Traditional process for making kinema. (3) Flow chart—Preparation of kinema starter. (4) Flow chart—Preparation of kinema

using selected strains. (5) Bar chart—Distribution of 4 types of bacteria in 4 samples of traditional kinema. (6) Graph—Change in cell propagules, temperature and moisture during the fermentation of kinema. (7) Graph—Change in the growth rate of selected microbes during kinema fermentation.

The paper is followed by 3 pages of discussion, in Japanese. Address: Central Food Research Lab., Babar Mahal, Kathmandu, Nepal.

1170. Kato, Eihachiro. 1986. Nattô no seizô—Dentô to gendai [Production of natto—Traditional and modern]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 246-48. Held July 1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts, p. 72. [2 ref. Jap]

• **Summary:** “In the traditional Natto making, cooked soybeans were wrapped in rice straw and kept in a warm environment until viscous material was formed by fermentation. The rice straw functioned as a natural donor of Natto starter bacterium. The rice straw was not only the donor of the starter responsible for Natto fermentation but it also played an important role in adjusting temperature, humidity and aeration as well as absorbing unpleasant ammoniac odor, which was essential for Natto manufacture using traditional technology. Nevertheless, rice straw was often contaminated with soil-borne microbes, and it was rather difficult to maintain good control of the process in the traditional method of Natto making.

“Dr. Shin Sawamura, in 1905, first isolated Natto *Bacillus* and characterized the isolates, which opened the way for pure cultures of the starter...

“The fermentation of Natto takes about 18 hours, starting at 40°C and rising to 50°C. The temperature in the fermentation chambers was maintained by a charcoal fire, electric heater or steam pipings, carefully watched by experienced technicians overnight.” Address: Meiji Daigaku, Japan.

1171. Kozaki, Michio. 1986. Monsuun Ajia no hakkô shokuhin [The fermented foods of monsoon Asia]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 5-8. Held July 1985 at Tsukuba, Japan. [Jap]

• **Summary:** A general review, including many fermented foods not containing soy. Address: Dep. of Agriculture, Tokyo Univ. of Agriculture.

1172. Nakao, Sasuke. 1986. Minzokugaku-sha to shite deatta koto domo [An ethnologist's recollections (on fermented soyfoods)]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 179-83. Held July

1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts, p. 64. [Jap]

• **Summary:** In 1962 the author was first introduced to kinema, a non-salted fermented soybean food, in eastern Nepal. Before that time on trips he had noticed that soybeans were commonly planted on the levees of paddy fields in Nepal, Sikkim, and Bhutan. In 1972 he proposed the hypothesis of the “triangular distribution” of non-salted fermented soybean foods, also known as the “natto triangle.” Since proposal of the hypothesis, many other examples of non-salted fermented soybean foods in the area have been reported. They are “Soeda” of Bhutan, “Pe-Boutsu” of Burma, “Thua-nao” of northern Thailand and many other examples in China proper (PRC) and in the Miao Tribe of Kweichow (Guizhou) Province of China. “In these examples, the local names are much different and no common word is found. This may suggest that the existence of fermented soybeans is not the result of recent dispersals from a central place of origin, but may have happened in rather ancient times. Then I came to the further assumption that within the triangular area there may have been a complex common human culture from olden times.

“In processing the non-salted fermented soybean, the artificial inoculation of the boiled soybean is sometimes practiced like in tempe. In Bhutan it is reported that the starter for fermentation is the same one which is prepared for the fermentation of alcoholic beverages. The fundamental method of making alcoholic beverages in the Himalaya and southeastern Asia is to inoculate the boiled cereals with the starter and then the main fermentation takes place in solid state, not in water. The process in making the non-salted fermented soybean and the alcoholic beverages can be understood to be a similar one. So they must have originated from the similar culture complex.”

Note: This is the earliest document seen (Jan. 2012) concerning “Soeda” of Bhutan, or “Pe-Boutsu” of Burma, both non-salted fermented soyfoods. Address: Professor Emeritus, Osaka Prefectural University.

1173. Odunfa, Sunday Ayo. 1986. Natto-like fermented foods of West Africa. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 258-62. Held July 1985 at Tsukuba, Japan. [Eng]

• **Summary:** Dawadawa (known as *iru* in Yoruba) is the Hausa name for a fermented food made from locust beans using *Bacillus subtilis* bacteria. It is the most important condiment in the entire grassland region of West and Central Africa. Uba [Ugba] is made by fermenting the seeds of the African oil bean (*Pentaclethra macrophylla*). Ogiri igbo is made by fermenting the seeds of the castor oil bean (*Ricinus communis*).

Each year an estimated 250,000 tons of locust beans are produced (mostly in northern Nigeria), from which



170,000 tons of dawadawa are made. The highest per-capita consumption of dawadawa (10 gm/day) is among the Yorubas of southwest Nigeria. Dawadawa is an important source of protein among the low-income rural population. It is made exclusively by women.

In a few states of Nigeria, local varieties of soybeans are used in place of locust beans. Address: Dep. of Botany and Microbiology, Univ. of Ibadan, Ibadan, Nigeria.

1174. Seki, Tatsuji; Oshima, Yasuji. 1986. DNA sôdôsei kara mita kosôkin to ruienkin no bunruigaku-teki kankei [The taxonomic relationship between *Bacillus subtilis* and related bacteria from the viewpoint of DNA homology]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 70-80. Held July 1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts, p. 53. [54 ref. Jap]

• **Summary:** Discusses *Bacillus subtilis*, gives a genetic map, and compares related species. The authors contend that, based on their evidence, strains listed as *B. subtilis* should be classified into two different species, *B. subtilis* and *B. amyloliquefaciens*. *B. natto* Sawamura, which includes various strains employed in natto production, is described as a synonym of *B. subtilis* in the 8th edition of Bergey's Manual. Address: Osaka Daigaku, Kôgaku-bu.

1175. Shiroza, Teruaki; Yamane, Kunio. 1986. Kôsokin no amiraae oyobi puroteaaze [Extracellular  $\alpha$ -amylase and proteases of *Bacillus subtilis*]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 234-43. Held July 1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts, p. 71. [15 ref. Jap]

• **Summary:** *Bacillus subtilis*, one of the strains used to make natto, produces many kinds of extracellular enzymes. Address: Tsukuba Daigaku, Seibutsugaku-kei (Inst. of Biological Sciences, Univ. of Tsukuba, Sakura, Ibaraki-ken 305, Japan).

1176. *SoyaScan Notes*. 1986. Japan's largest natto manufacturers (Overview). Dec. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** (1) K.K. Okame Natto Honpo, 15-14 Ogawa, Ogawa-cho, Ibaragi-gun, Ibaragi-ken, Japan.

(2) Asahi Shokuhin K.K., 180-2 Kamido, Ushihori-cho, Gyoho-gun, Ibaragi-ken, Japan. (3) Ugo Shokuhin Kogyo K.K., Noaramachi, Aza Kaido no ue 279, Sennan-mura, Senboku-gun, Akita-ken, Japan.

(4) Taishi Shokuhin Kogyo K.K., Kawamorita, Aza Okinaka 68, Santo-cho / machi, Santo-gun, Aomori-ken 039-01, Japan.

(5) K. K. Azuki Shokuhin, Sekibori 1001, Utsunomiya-

shi, Tochigi-ken, Japan.

Note: Each of these large natto makers is located in the northeast prefectures (*Tohoku Chiho*) of Japan.

1177. Suwana-Adth, Malee; Daengsubha, Wanchern; Suyanandana, Puangpen. 1986. The microbiology of Thua-nao in Thailand. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 31-38. Held July 1985 at Tsukuba, Japan. [8 ref]

• **Summary:** Describes the traditional production method, microbiology of natural fermentation, keeping quality of thua-nao, chemical composition and nutritional value. Address: 1. National Center for Genetic Engineering and Biotechnology; 2-3. Thailand Inst. of Scientific and Technological Research, Bangkok.

1178. Takao, Shoichi. 1986. Nattô kenkyû no rekishi-teki kôsatsu [An historical overview of natto research]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 61-69. Held July 1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts, p. 52. [Jap]

• **Summary:** "Natto in Japan generally means Itohiki-Natto, which is a unique product in this country. A very small amount of Shio-Natto derived from China is also manufactured in some limited localities.

"The first description of Natto bacterium was by Dr. Kikuji Yabe in 1894, who isolated three *Micrococci* and one *Bacillus* from Natto, but was unable to determine that those isolates were responsible for Natto fermentation. In 1905, Dr. Shin Sawamura first isolated a bacterium that could produce good Natto by its single inoculation, and named the isolate *Bacillus natto* Sawamura, a novum species. This was the discovery of Natto Bacillus.

"Subsequently, Prof. S. Muramatsu of Morioka Agricultural Academy, and Prof. Jun Hanzawa of Hokkaido University did research and extension / education on natto manufacture with pure starter cultures of Natto Bacillus, and it was Prof. Hanzawa's great contribution that the natto technology which is widely used in the nation today was firmly established and disseminated.

"The traditional manufacture of Natto, namely wrapping of cooked soy in rice straw to ferment the beans, depended on natural inoculum from straw, but that process had problems with sanitation and did not guarantee a consistent quality of products. Prof. Hanzawa introduced not only good starter cultures, but also a new method, to use a container in place of straw. He organized in 1919 an association of natto container improvement, started to publish a journal 'Natto' and was greatly committed to the education of Natto manufacturers. Mr. Jirô Miura, The First President of National Natto Manufacturer's Association (presently

National Federation of Natto Manufacturers' Cooperatives) established in 1940, was among those who were directly guided by Prof. Hanzawa.

"The new technology rapidly disseminated in the nation and even in the Japanese communities on the Chinese mainland and Latin America. This fact reflects the excellence of the new technology developed under the guidance of Prof. Hanzawa.

"In microbiological research on Natto *Bacillus*, a great number of reports were published on taxonomy, nutrient requirements, formation of mucous materials, enzymes, antibiotic activities and phage infection. *Bacillus natto* named by Dr. Sawamura was included in *Bacillus subtilis* in Bergey's Manual of Determinative Bacteriology 6th Edition (1948), and has not been recognized as an independent species since then. However, Natto *Bacillus* has many different properties from *Bacillus subtilis*, and still maintains its naming at present, especially in the Natto manufacture."

Contains numerous photos, including: 1920 post card from the Society for the Improvement of the Natto Container. Ad for the first pure-culture natto bacteria cultured by Dr. Hanzawa. Dr. Jun Hanzawa. Address: Hokkaido Univ., Nôgaku-bu.

1179. Toyoda, Motoo. 1986. Jiba sangyô to shite no nattô to sono eisei kanri [Natto manufacture as a rural agro-industry and its sanitary management]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 263-67. Held July 1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts, p. 75. [4 ref. Jap]

• **Summary:** "Natto is one of the most efficient nutritious foods and first appeared in food history more than 2,000 years ago. There are two types of Natto, 'Shiokara-natto (salted)' and 'Itohiki-natto (non-salted)'... Ibaraki prefecture is one of the largest producers of 'Itohiki-natto' and the best place to maintain their high quality in Japan. The 'Itohiki-natto' in Ibaraki prefecture is also known as 'Mito-natto' and is one of the major genuine products in Ibaraki prefecture. There are 34,000 tons of 'Mito-natto' produced annually, comprising 20% of all products in Japan (1984).

"There are several reasons why 'Mito-natto' is so popular with consumers. 'Mito-natto' is made from small grain soybeans. Therefore, the taste of 'Mito-natto' is very mild and soft. Due to the Kanto loam, only small grain soybeans can grow in Ibaraki prefecture. From the Tokugawa Era (200 years ago), these small grain soybeans have been harvested before the typhoon season due to their early-ripening character... The small grain soybeans are difficult to use for making Tofu and Miso... Interestingly, *Bacillus natto* can grow better on small grain soybeans than large ones. This feature allows 'Mito-natto' to have unique stickiness with special flavor.

"The container of 'Mito-natto' is quite unique. More than 96% of manufactured 'Mito-natto' is packed in PSP (polystyrene paper) containers. This Natto is distributed widely through grocery stores. The remaining 4% of 'Mito-natto' is packed in a traditional container called 'Tsuto-natto' made of straw. Ibaraki is the only place where 'Tsuto-natto' is permitted to be used as a Natto container. Historically, 'Mito-natto' was first sold at Mito station in 1889. Since then, this type of Natto is mainly sold in souvenir shops, especially Kiosks, located on major JNR (Japan National Railway) stations...

"In 1961, Ibaraki prefecture established the standard methods for inspecting the quality of Natto. In Ibaraki, three organizations, Ibaraki prefectural Institute of Health, Environmental Sanitation Section of Ibaraki Government and Ibaraki Natto Maker's Association, have been working closely to prevent any possible safety problems associated with the manufacturing and marketing of Natto." Address: Technical advisor of Ibaraki prefecture, and Purima Hamu K.K. (Prima Ham).

1180. Ueda, Seinosuke. 1986. Nattô-kin no "purasumido" kaiseki [Analysis of natto bacillus plasmids]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 81-91. Held July 1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts. p. 55. [Jap]

• **Summary:** "The unique feature of Japanese natto, a traditional fermented food, is the formation of mucous materials by the *Bacillus*, namely levan-like polysaccharides and gamma-polyglutamic acid, the latter being the chemical principle of mucous appearance of natto. It was discovered that the gene that is responsible for the formation of gamma-polyglutamic acid can be transferred into *Bacillus subtilis* Marburg strains that are incapable of forming gamma-polyglutamic acid, by means of genetic transformation technique at high frequencies...

"The isolation of this small plasmid from more than ten starter strains of natto *Bacillus* was conducted in order to assess the homology of the plasmid isolation... In order to look further into the function of the small plasmid of natto *Bacilli*, many spore-forming aerobic rods that are recognized as natto *Bacillus*-like microorganisms were isolated from Japanese natto-like fermented soybean foods that are popular in the daily diet of East Asia, namely Chinese To-chi, Nepalese Kinema and Thai Thua-nao, and plasmids of each isolate were compared. Every isolate tested contained small plasmids of 5.7-9.6 kb [kilobase molecular weight] all of which demonstrated quite a high degree of homology with natto *Bacilli* plasmid pUHI of 5.7 kb, which codes gamma-glutamyl transpeptidase gene controlling the formation of gamma-polyglutamic acid.

"The comparative studies on these plasmids derived

from natto *Bacilli* and *Bacilli* from natto-like fermented foods of East Asia may reveal the origin and evolution of natto *Bacillus* plasmid and may ultimately clarify the history of dissemination of such fermentation technologies.” Address: Kumamoto Kogyo Daigaku [Kyushu Univ.].

1181. Yoshida, Shuji. 1986. Minzokugaku kara mita muen hakkô daizu to sono shûhen [The origin of non-salted fermented soybeans from the viewpoint of ethnology]. In: Kô Aida, et al. eds. 1986. Proceedings of the Asian Symposium on Non-Salted Soybean Fermentation. Japan: Takeshima Shigeru. 319 p. See p. 166-78. Held July 1985 at Tsukuba, Japan. English-language summary in Symposium Abstracts, p. 62-62. [20 ref. Jap]

• **Summary:** “Two of the earliest kinds of fermented soybeans were *shì* and *dòu-jiàng*. The former antedates the latter, because *shì* can be traced to the Han Dynasty (206 BC-A.D. 200), whereas *dòu-jiàng* does not emerge until the description in *Qimin Yaoshu* (A.D. 536-550). Good descriptions of *shì* and *dòu-jiàng* are given in *Qimin Yaoshu*. *Shì* is made as follows: A yellow mold is permitted to grow on boiled beans, which are then washed and wetted, after which they are fermented in a cellar for 10-12 days. *Shì* was eaten as a condiment.

“However, *shì* as a food would have appeared prior to *shì* as a condiment. *Sake* which was made from grain through mold fermentation, was originally not for drinking, but rather for eating. Such a primitive *Sake* is still used in Yúnnán. I suppose that a primitive *shì* also was eaten, and that the place of origin of *shì* was South China, according to the description in *Bencao Gangmu* (*shì* was commonly made in South China), and *Bówùzhì* (*shì* was exotic).

“*Dòu-jiàng*, which may have been first mentioned in *Bencao Gangmu* (1596), was a simple mold bean and was technologically more primitive than *shì*, although the existence of *dòu-jiàng* or a similar substance cannot be traced in the literature before *Qimin Yaoshu*. It seems that the first product of fermented beans would be *dòu-jiàng*, or a similar substance, and that its making would have been influenced by *sake* production. Later, *shì* as a food would have appeared and then *shì* as a condiment was produced, as we see from the *Qimin Yaoshu*.

“On the other hand, *dòu-jiàng* was developed from *ròu-jiàng*, preserved meat... *Natto*, *kinema* and *tempeh* would be identified as a substance similar to *dòu-jiàng*, which was a primitive fermented soybean product. Boiled beans became *dòu-jiàng* if they were covered by *Imperata cylindrica* grass, *kinema* if covered by certain leaves, *tempeh* if covered by leaves of *Hibiscus tiliaceus* or banana leaves, and *natto* if covered by ricestraw.

“We know that various kinds of plants are used for making *sake* or mold bran. The species used varies by place. Fermented soybeans occur within the *sake*-making area and only at the margin of the distribution. That means several

new fermented soybean products like *shì* and *dòu-jiàng* were made in the center of the fermented soybean distribution, and the area gradually expanded toward the margins. They were accepted in areas close to the center, but the most primitive forms would have remained only in the marginal places, where new ones were not accepted.”

A large chart (p. 169) shows the relatives and development of fermented black soybeans (*shì*); it includes the names of various unsalted fermented soyfoods and soy condiments (with their geographical area in parentheses). Relatives (fermented soyfoods made from yellow soybeans): Akuni (Sema Naga, in the Himalayas in northeast India), kinema (Limbu, in eastern Nepal), pe-bout (Shan, in eastern Burma), itohiki natto (Japan), and tempeh (Indonesia). Stage 1. Itohiki natto became Chon Kujjiang [perhaps *chungkuk jang*, Korean-style natto] of the Zhanguo Warring States period (475-221 BC) in China. Stage 2A: Unsalted fermented black soybeans were originally used as a food, rather than as a seasoning. To these unsalted fermented black soybeans, koji was added to create homemade unsalted fermented black soybeans (*doushi*, of China), Stage 2B: Salt was added to the unsalted fermented black soybeans to make various salted foods (each with a firm texture like raisins): Daitokuji natto (Japan; with wheat flour added), *pe-ngapi* (upper Burma), and *seang* (Cambodia). Stage 3. Unsalted fermented black soybeans (*doushi*) developed into closely related danshi. Koji was added to danshi to make *rul-kre* (of Bhutan). Cooked soybeans were shaped into balls and fermented naturally to make miso-dama (“unsalted miso balls” [meju], Korea and Japan). Then salt was added to the miso-dama to make various seasonings (each with a consistency like applesauce or paste / miso): Korean soybean jang (*doen jang*), Korean soy sauce (*kan jang*), or soybean miso (*mamé miso*, Hatcho miso, Japan). Stage 4. Salt was added to unsalted fermented black soybeans (*shì*) to make salted fermented black soybeans, from which developed inyu (a fermented soy sauce made with black soy beans, in Taiwan), *inshi* (meaning unclear, of Taiwan), and taucho (*tauco*, of Indonesia). Stage 5. Koji was added to salted fermented black soybeans to make *shì* for food use, and *doushi* (of Sichuan, China). Stage 6. Flour was added to salted fermented black soybeans to make red pepper jang (*kochu jang*, Korea) and spicy fermented black soybeans (*doubanshi*, China).

Note: This chart may be easier to understand when viewed in chart form, however the logic and some of the products seem a bit unclear. It is also unclear which products are fermented with bacteria (like natto). Soyfoods Center has an English-language translation of this chart. Address: National Museum of Ethnology, Osaka (Kokuritsu Minzokugaku Hakubutsukan).

1182. Ichishima, E.; Takada, Y.; Taira, K.; Takeuchi, M. 1986. Specificities of extracellular and ribosomal serine proteinases from *Bacillus natto*, a food microorganism.

*Biochemica & Biophysica Acta* 869:178-84. \*

1183. Ontario Soya-Bean Growers' Marketing Board. 1986. Ontario soybeans in Japan (Color videotape). Chatham, Ontario, Canada. 23½ minutes. Undated.

• **Summary:** Shows how Ontario soybeans are used to make tofu, miso and natto in Japan. Includes interviews with end users who make tofu, miso, and natto.

Note: This is the earliest known videotape about soy or tofu owned by Soyfoods Center. Address: Chatham, Ontario, Canada.

1184. Shinoda, S.; Yoshida, T. 1986. [Phytic acid content of soy-milks and fermented soybean]. *Tachikawa Tandai Kiyo* 19:71-73. (Chem. Abst. 105:151795). [Jap]\*

1185. Taguchi, K.; Kawabata, M.; Ohtsuki, K.; Tanaka, Y. 1986. [Changes in dietary fiber of natto and tempeh during fermentation]. *Nihon Eiyō Shokuryō Gakkai-shi (J. of the Japanese Society of Nutrition and Food Science)* 39(3):203-08. [15 ref. Jap; eng]\*

• **Summary:** Total dietary fiber in both natto and tempeh decreased slightly during fermentation. Pectic substances in natto increased 14%, and the relative amounts of the component sugars (arabinose, galactose and galacturonic acid) increased during the fermentation, while no significant change was observed in the amount of dietary fiber and the component sugars in the oxalate insoluble residues. The hemicellulose fraction decreased in the tempeh during fermentation, but a marked increase of glucosamine was observed in the oxalate insoluble residues. The increase may reflect the contribution of mycelia polysaccharides to the dietary fiber of tempeh. Address: Dep. of Food Science, Kyoto Prefectural Univ., Kyoto 606, Japan.

1186. Aidoo, K.E. 1986. Lesser-known fermented plant foods: Review. *Tropical Science* 26:249-58. [29 ref]

• **Summary:** Fermented plant foods may be classified into four main groups, including those made from pulses, nuts, and other seeds such as dawadawa (Savannah Africa) and ontjom (West Java, Indonesia). Four others from this group are:

(1) Ogiri, fermented watermelon seeds (*Citrus vulgaris*) made and consumed in West Africa. In Nigeria, ogiri is made by traditional fermentation methods to yield a highly priced food condiment, whose quality is variable and storage life is short. S.A. Odunfa (1981) reported that *Bacillus* species were active during the early stages of the fermentation, whereas *Proteus* and *Escherichia* species were the predominant microorganisms during the later stages.

(2) Ugba is made from oil bean seeds, which are produced by the African oil bean tree (*Pentaclethra macrophylla*), a leguminous tree generally planted along the roadsides in big towns and cities. When the fruit matures, the

seed pods turn black and “explode” / shatter to release glossy brown, edible seeds, typically eight per pod. Rich in protein and essential fatty acids, these seeds are fermented for about 72 hours to make *ugba*, which is popular among the Ibos / Igbos of Nigeria. In 1983 Obeta outlined the process and stated that the predominant microorganism was *Bacillus* species.

(3) Lupin seeds (*Lupinus mutabilis*) are fermented by Peruvian Indians of the Andes.

Kawal is a protein-rich food from Sudan made by fermenting the leaves of a wild African legume, *Cassia obtusifolia*; it is usually cooked in soups and stews in much the same way as dawadawa. The leaves of the plant are pounded into a paste, placed in an earthenware jar or pot, and covered with sorghum leaves. The jar is buried in a cool place and the contents are mixed by hand ever 3 days. After 14 days, the fermented paste is shaped into small balls, which are sun-dried.

Note: Dirar (1984, p. 342-49) reported that the bacterium *Bacillus subtilis* is one of the main microorganisms involved in the fermentation; the paste is used as a meat substitute. Address: Dep. of Bioscience and Biotechnology, Applied Microbiology Div., Univ. of Strathclyde, 204 George St., Glasgow G1 1XW [Scotland] UK.

1187. Batra, L.R. 1986. Microbiology of some fermented cereals and grain legumes of India and vicinity. *Mycologia Memoir* No. 11. p. 85-104. Chap. 6. (C.W. Hesseltine and Hwa L. Wang, eds. *Indigenous Fermented Food of Non-Western Origin*. Berlin & Stuttgart: J. Cramer). [24 ref]

• **Summary:** Pages 89, 101-02 discuss kenima [sic, kinema], a soyfood fermented for 2-3 days with *Bacillus subtilis*. “Kenima is a soybean product, amorphous and slimy in appearance. It is popular in Nepal, Sikkim, Darjeeling, and neighboring districts of India, but its antiquity is unknown. It is produced in low lying warm valleys of the area but is also marketed in Kalimpong, Darjeeling, and other stations in the eastern Himalayas. It is deep-fried, salted, and used as an adjunct to staples such as rice. Uncooked kenima has a strong, ammoniacal odor but when deep-fried and salted, it has a rather pleasant, nutty flavor.

“Whole soybeans are washed, soaked for about 24 hours, cooked in water for 2-6 hours, or until reasonably soft, and cooled to about 40°C. The beans (moisture 46-55%), presumably inoculated by chance inoculum, are wrapped in suitable broad leaves in 200-250 gm portions and the packets are tied with rice straw. These packets are stacked in small piles, often covered by rice straw or hay for insulation, and incubated for 48-72 hours. The incubation temperature ranges from 35-45°C (earlier reported erroneously as ‘22-30°C’, Batra and Millner, 1976). At the end of this period, the beans are softer and are covered with a thick, white, mucilaginous coating. No yeasts or filamentous fungi were

recovered consistently from 5 samples analyzed from Darjeeling. As reported earlier, 2 rod-shaped, acid-producing bacteria present at levels of 2,200,000-26,000,000 (gdw = per gram dry weight basis) were recovered, and one of these appears to be *Bacillus subtilis* (Ehrenburg) Cohn.” Address: Mycology Lab., Plant Protection Inst., USDA, Agricultural Research, Beltsville Agricultural Research Center, Beltsville, Maryland, 20705.

1188. Colbin, Annemarie. 1986. *Food and healing*. New York, NY: Ballantine Books. 351 p. Foreword by Robert S. Mendelsohn, M.D. Index. 23 cm. [207\* ref]

• **Summary:** A very interesting, wholistic look at food trips and philosophies—with a preference for macrobiotics. Discusses miso, natto, tempeh, and tofu. Pages 169-72 discuss beans, including soybeans. Beans are said to be contractive, acid-forming, warming, and a buildup food. “Folklore has it that appreciable quantities of soybeans and their products, especially tofu, can lower, or cool, sexual energy. Research done at the universities of Illinois and Kansas has shown that soybeans may interfere with the absorption of zinc. As zinc is one of the minerals most strongly associated with the healthy functioning of the sex glands, this bit of folk wisdom appears realistic.”

Chapter 12, titled “Food as Medicine,” discusses healing foods and tells how to prepare them, including miso soup (p. 253; contractive, alkalinizing, warming, breakdown). Miso soup is considered a good food to help cure the common cold, to neutralize the negative effects of excess sugar consumption, and to combat problems of inflammation of the digestive tract (ulcers, colitis, spastic colon, etc.); ulcers are problems of excess acidity.

Chapter 14, titled “The Effects of Food on Sex,” notes that “Scientific studies have found that individual foodstuffs have an effect on sexuality via their chemical constituents... soybeans (including tofu) contain traces of antithyroid factors; as the thyroid regulates sexual desire, activity, and fertility, when consumed in large enough quantities these foods could possibly inhibit sexuality by lowering thyroid energy. Oriental folk rumor, which I’ve been unable to verify, has it that tofu ‘cools the sex organs’ and is used by monks for the specific purpose of aiding them in maintaining celibacy. In this light, it’s interesting to note that the traditional Japanese diet, high in thyroid-depressing soybean products, also contains appreciable amounts of seaweeds, rich in thyroid-stimulating iodine.”

In the Foreword, Dr. Mendelsohn writes: “Coming from a background of modern medicine, I, as well as hundreds of thousands of other M.D.s, was carefully educated in nutritional ignorance—indeed in disdain for food. The hospital ‘dietician’ was not—and is not even today—a teacher of physicians. The dietician’s traditional purpose in life has always been to serve as a ‘referral’ for a patient who bothered the physician with too many questions about food.

The very title of this book *Food and Healing* represents a joining of two concepts that most doctors regard as unrelated.”

A photo (p. 351) shows Annemarie, who was born in Holland and brought up in Argentina on a European vegetarian diet. After her arrival in the United States in 1961, she was introduced to macrobiotics. She lives in New York City with her two daughters, and directs the Natural Gourmet Cookery School there. Address: 365 West End Ave., New York City, NY 10024. Phone: 212-580-7121.

1189. Durston, Diane. 1986. *Old Kyoto: a guide to traditional shops, restaurants, and inns*. Tokyo, San Francisco: Kodansha International. 240 p. Foreword by Donald Richie. Illust. (photos by Lucy Birmingham). Indexes (by type of shop; alphabetical list of shops). 19 cm. [17 ref]

• **Summary:** “A completely revised version of the classic guidebook to Kyoto, with a foreword by Donald Richie. Down the cobbled paths and behind the tranquil noren curtains of Kyoto, the old way of life goes on, nurtured in the restrained furnishings of the traditional inns and in the old shops where fine handmade items still add a touch of quality to life. Since the first edition appeared in 1986, this lovingly written travelogue-cum-guidebook has become de rigueur for knowledgeable travelers seeking to find ‘the real Kyoto.’ With 51 maps and over 120 photos of the living heart of this ancient capital—and a vanishing way of life. Each shop featured in the book is accompanied by a photo showing its front and a map showing its location” (from the publisher).

Tofu is mentioned on pages 9, 30, 53, 55, 116, 121 (Okutan), 123, 147, 158, 193, 201, 234, 239.

Miso is mentioned on pages 53, 100, 123 (dengaku), 147, 179, 213, and 233.

Yuba is mentioned on pages 30, 59, 61, 147, and 234. Natto is mentioned on pages 49, 183, 233, and 239.

*Shōjin ryōri*, the vegetarian [actually vegan] food served in Buddhist temples, was also developed in Kyoto from its prototype, *fucha ryōri*, brought from China by priests. Yuba, uncooked wheat gluten (*nama-fu*), and tofu are all part of *shojin ryori* (p. 30).

Fuka (p. 50-52) is a shop that specializes in making wheat gluten, including *nama-fu*, the chewy variety, that is made from half regular wheat gluten and half glutinous rice flour (*mochi-gome*). Wheat gluten is an important part of the vegetarian diet of Zen monks.

Iriyama Tofu (p. 53-55) makes tofu (*momen-dōfu*) in the traditional way, using nigari as a coagulant. The owners (Mr. and Mrs. Iriyama) are 9th generation tofu makers, working in a 120-year-old building. Using a charcoal fire they make grilled tofu (*yaki-dōfu*). They also make deep-fried tofu pouches (*o-age*) and tofu balls (*hiryōzu*).

Yubahan (p. 59-61) makes yuba in the traditional way using a wood fire and soybeans cooked over an old clay *kamado* stove. “No clocks or timers are involved.” Tomizo

Asana is the 9th generation yuba maker. “Yubahan started making yuba in 1716, but all family records were destroyed in the huge fire of 1864 that destroyed much of the city.”

Takasebune (p. 98-100) specializes in tempura, with a tempura dinner (*tempura teishoku*) including a “generous bowl of miso soup.”

Tamatomi (p. 116-17) offers teppin-age (a fry it yourself tempura meal) and oden stew (with tofu).

Okutan (p. 120-23), inside the north gate of famous Nanzen-ji temple, is famous for its tofu cookery. It has served *yudofu* (fresh tofu simmered in a big ceramic pot over a charcoal fire, with a shoyu dipping sauce) for 12 generations and 300 years. Side dishes include vegetable tempura and tofu dengaku.

Nakamura-ro (p. 136-38) is famous for its tofu dengaku (with miso).

Bunnosuke-jaya (p. 142-44) specializes in amazake.

Ikkyû-an (Ikkyu-an, p. 145-47) serves fucha ryori (Chinese-style vegetarian temple food, including sesame tofu, tofu dengaku. It is named after the famous Zen monk and priest Ikkyû Sôjun {Ikkyu Sojun}).

Takocho (p. 158), 100 years old with 15 seats at the counter, features oden stew with tofu.

Ichiwa (p. 178-80) which makes rice cakes (mochi) and abura mochi (cakes of glutinous rice flour dough that are charcoal grilled on green bamboo skewers then dipped into a sweet miso sauce).

Isoda (p. 181-83, 41 Shimomonzen-cho, Murasakino, Kita-ku, southeast of Daitoku-ji. Phone: 075-491-7617) is said to be the best and oldest maker of Daitokuji natto in Kyoto; their fermented black soybeans are sold in a small wooden box. After Daitoku-ji “was destroyed in the Onin Wars (1467-77), an eccentric Zen priest named Ikkyû supervised the reconstruction of the temple and became its 47th (and most celebrated) abbot. According to legend it was Ikkyu who introduced the Chinese Buddhist recipe for this compact, high-protein treat” for mendicant Zen monks. The original recipe, which is still used at Isoda, is described. Because warm weather and natural sunlight are necessary, Daitoku-ji natto can only be made during the summer months, most often in August after the rainy season has abated. Even Sen no Rikyu, the famous Japanese tea master, is said to have been an ardent fan of the salty morsels—which are still served with ceremonial tea. Chûgo Isoda, the present owner, is a 17th generation maker of Daitokuji natto. He and his wife work together during the hot summer making the fermented black soybeans. A full-page photo shows Mr. Isoda mixing a shallow tub of the dark fermenting beans. Daitoku-ji natto are also mentioned on page 49.

Nishiki (p. 197-99) is famous for its kaiseki ryori. “Every month the ingredients are completely changed to match the season.” One dish is karashi-dôfu (“mustard tofu”).

Sagano (p. 201-02) serves simmering tofu (*yudôfu*) in

the bamboo forest just south of Tenryu-ji temple.

The excellent “Glossary” (p. 230-32) includes entries for: Amazake, fu (wheat gluten), kaiseki, miso, mochi, nattô (fermented soybeans), oden, o-hagi, shôjin ryôri, sukiyaki, tofu, yuba, yûdofu. Address: Kyoto, Japan.

1190. Hesseltine, C.W.; Wang, H.L. 1986. Indigenous fermented foods of non-Western origin. *Mycologia Memoir* No. 11. 351 p. Berlin and Stuttgart: J. Cramer. Published for the New York Botanical Garden in Collaboration with The Mycological Society of America. Illust. Index. 24 cm.

• **Summary:** Contains 18 chapters by various authors. Each chapter that mentions soy is cited separately. Address: NRRC, Peoria, Illinois.

1191. Hesseltine, C.W. 1986. Microorganisms involved in food fermentations in tropical Asia. In: Susono Saono and F.G. Winarno, eds. 1986. Proceedings of International Symposium on Microbiological Aspects of Food Storage, Processing and Fermentation in Tropical Asia. x + 344 p. See p. 189-204. Held 10-13 Dec. 1979 at Cisarua, Bogor, Indonesia. Illust. 24 cm. [18 ref]

• **Summary:** Three pioneers of the taxonomy of molds used in fermented foods were Drs. R. Nakazawa, K. Saito, and C. Thom. Fermentations can be classified as Homofermentations (only one species of microorganism is necessary to produce the product; e.g. natto, onchom, tempeh, fermented tofu), Heterofermentations (more than one is required; e.g. Chinese yeast, or ragi), Homomultifermentations (two or more strains of the same species are used together; e.g. miso, shoyu, soy yogurt).

Tables show: (1) Representative strains of cultures in Oriental food fermentations: Miso—*Aspergillus oryzae*, *A. sojae*, *Saccharomyces rouxii*, *Pediococcus halophilus*. Tempeh—*Rhizopus oligosporus*. Sufu—*Actinomucor elegans*, *Mucor dispersus*. Address: NRRC, Peoria, Illinois.

1192. Hesseltine, C.W.; Wang, Hwa L. 1986. Food fermentation research and development. *Mycologia Memoir* No. 11. p. 9-22. Chap. 1. (C.W. Hesseltine and Hwa L. Wang, eds. Indigenous Fermented Food of Non-Western Origin. Berlin & Stuttgart: J. Cramer). [13 ref]

• **Summary:** The following fermented soyfoods are discussed: Miso, shoyu, natto, hamanatto, sufu, tamari, ontjom, tempeh. Address: USDA/NRRC, 1815 N. University St., Peoria, Illinois 61604.

1193. Kondo, Sonoko; Stoumen, Lou. 1986. The poetical pursuit of food: Japanese recipes for American cooks. New York, NY: Clarkson N. Potter. 296 p. Illust. by Etienne Delessert. Index. 25 cm.

• **Summary:** A very artistic, attractive, and authentic book with superb (imaginative and lyrical) illustrations. The section titled “Staple foods you will need” (p. 17-20)

discusses soy sauce, konbu and nori seaweeds, sesame seed paste (*atari-goma*; “Most Americans may be more familiar with the Middle Eastern version called tahini paste... Used in making salad dressings and dips”), miso, and sesame seeds. Soy-related recipes include: Grilled tofu with miso (Dengaku; p. 37). Sesame tofu (p. 38; no soy). Tuna sashimi and green onions with miso (p. 40). Daikon radish with lemon miso (p. 42). Cauliflower florets with miso (p. 42). Basic miso soup (p. 51). Clam miso soup (p. 51). Daikon radish miso soup (p. 52). Vegetable and chicken miso soup (p. 52). Tofu and wakame seaweed suimono (p. 53). Fried rice with tofu and vegetables (p. 89).

Chapter 7, titled “Tofu & egg dishes” includes (p. 103-17): Tofu in Kamakura. Description of different types of tofu: Silken, firm, grilled, pouches, deep-fried, fritters (*ganmodoki*), freeze-dried (*koya-dofu*), how to press tofu. Chilled tofu with ginger sauce. Braised *koya-dofu* with pea pods. Cold-day tofu. Vegetarian “chicken” tofu (with frozen tofu). Dragon’s head (*hiryo-zu*). Tofu from the sea (*Kenchin-mushi*). Tofu gratinée. Stuffed tofu. Scrambled tofu. Tofu treasure bags. Vegetarian “burger.” Egg tofu delight (*tamago-dofu*; no soy).

Beans for breakfast (*natto*; p. 125). Braised konbu seaweed, soybeans, and konnyaku (p. 128). Hijiki seaweed with tofu (p. 129). Stuffed tofu sushi (*Inari-zushi*; p. 157). Snapper tempura with asparagus and miso (p. 174). Marinated cod in miso sauce (p. 179). Seaweed, chicken, and vegetables with creamy miso (p. 185). Steak miso (p. 190). Sukiyaki (p. 206). Shabu shabu (p. 208). Vegetarian nabe (with tofu, p. 211). Sea and mountain (with miso sauce, p. 212-23). Winter nabe (with tofu, p. 214). Udon-suki (with tofu, p. 216). Tofu apple cake (p. 244). Chapter 15 (p. 260-71) is menu plans, by season and time of day.

The glossary (p. 272-82) includes: Agar-agar, azuki beans, konbu seaweed, kuzu, miso paste, nori seaweed, rice cakes (*mochi*), sesame seed oil, sesame seeds, soybeans–fermented (*natto*), soy sauce, tofu, tonkatsu sauce (with dark soy sauce), wakame seaweed. Address: Los Angeles, California.

1194. Odunfa, S.A. 1986. Dawadawa. In: N.R. Reddy, M.D. Pierson, and D.K. Salunkhe, eds. 1986. Legume-Based Fermented Foods. Boca Raton, FL: CRC Press. [viii] + 254 p. See p. 173-189. Chap. 11. [63 ref]

• **Summary:** Contents: Introduction: Quantity produced, consumption patterns. Method of preparation: Raw materials, commercial preparation of dawadawa, postfermentation treatment, upgrading production technology. Microbiological and physico-chemical changes during fermentation: Microorganisms, physico-chemical changes. Nutritional composition and quality. Toxicological aspects. Conclusions and future research needs. Dawadawa is the Hausa name for the fermented African locust bean (*Parkia biglobosa*) It is an important condiment in the entire savanna region of West

and Central Africa. Countries where dawadawa is important include the northern regions of Nigeria, Ghana, Togo, Benin, Chad, Sierra Leone, Upper Volta, Gambia, Cameroon, Ivory Coast, Guinea, Mali, Senegal, and the semi-desert country of Niger.

Dawadawa is also know as *iru* in Yoruba (spoken in southwestern Nigeria), as *ogiri-igala* in Ibo (spoken in southeastern Nigeria), “as *kpalugu* among the Kusasis and Dagombas of Northern Ghana, as *kinda* in Sierra Leone, and as *netetou* or as *soumbara* in Gambia.”

More than 100 million people living in West Africa use dawadawa as a foodstuff. Cobley and Steel (1976) estimated that 200,000 tons per year of African locust beans are gathered in northern Nigeria alone, from the trees on which they grow. In addition, large amounts are produced in the savanna regions of Oyo and Kwara states in southwestern Nigeria. Some of the beans collected in northern Nigeria are sold to the Yorubas or Ibos of southern Nigeria, where half the area is rain forest so that there is a shortage of locust beans.

Each locust bean tree yields approximately 25 to 52 kg of pods from which 6 to 13 kg of beans may be obtained. About 250,000 tons of locust beans are produced, from which about 170,000 tons of dawadawa are made.

“In place of locust bean seeds, local varieties of soybeans are used as a substitute to make dawadawa in the Benue and Plateau states of Nigeria” (p. 175).

Although dawadawa is used mainly as a flavoring, it also contributes to the protein and calorie intake.

To make soybean dawadawa, soybeans are first fried until they are brown in color. Then they are ground to remove the seed coat (*testa*). The dehulled soybeans are boiled in water for 3 hours, then drained using a calabash sieve and spread in a basket lined with leaves. Previously fermented soybean dawadawa is added to the basket and mixed with the cooked soybeans. The basket is then covered with the same leaves used to line the basket. The covered basket is placed in a warm place for 2-3 days for fermentation. The fermented soybeans are sun-dried then pounded to a fine powder (p. 179). Address: Dep. of Botany, Univ. of Ibadan, Ibadan, Nigeria.

1195. Ohta, Teruo. 1986. Natto. In: N.R. Reddy, M.D. Pierson, and D.K. Salunkhe, eds. 1986. Legume-Based Fermented Foods. Boca Raton, FL: CRC Press. [viii] + 254 p. See p. 85-93. Chap. 5. [25 ref]

• **Summary:** Contents: Introduction: Types of natto, production and consumption. Method of preparation: raw materials, preparation of *itohiki natto* (soaking and cooking of soybeans, inoculation and packaging, fermentation, maturation and stabilization), preparation of *yukiwari natto* and *hama-natto*, fermentation microorganisms. Composition and physical properties: Chemical composition, physical properties (mucous material, spots on natto, organoleptic

properties). Nutritional quality. Toxicology. Conclusions.

The three major types made in Japan are itohiki natto, yukiwari natto, and hama-natto; each has its own method of preparation. Itohiki natto (sticky natto) is made by fermenting whole cooked soybeans with *Bacillus natto*; it is made in large quantities and, in Japan, accounts for more than the total production of the other two types. Yukiwari natto is made by mixing itohiki natto with rice koji and salt, then aging the mixture. Hama-natto is made by inoculating cooked soybeans with the koji mold, *Aspergillus oryzae*. Hama-natto is made in and around only two small parts of Japan: the cities of Hamamatsu and Kyoto, where it is sold as a local souvenir food item.

The earliest document known to have mentioned the word “natto” is the *Shin Sarugaku Shiyu*, written by A. Fujiwara [Fujiwara no Akihira] in 1068; yet no description was given of the method for making this natto. Itohiki natto has long been used as a feed for livestock by village farmers and as a food in Buddhist temples during the winter. During its early history, natto was prepared by simply wrapping warm, cooked soybeans in rice-straw bundles, and leaving the wrapped soybeans at ambient temperature. Modern techniques involved the use of starter cultures such as *Bacillus natto* developed after the 1920s.

Production and consumption in Japan: In 1982 the production of itohiki natto was about 170,000 metric tons (tonnes), requiring the use of about 85,000 tonnes of soybeans. [So from 1 kg of soybeans one gets about 2 kg of finished natto]. This amount is nearly a 10% increase over 1980. This large increase, in only two years, which is extraordinary among Japanese traditional fermented foods, may be due to: (1) the growing concern of the Japanese public over the relationship between diet and health, and over the excess intake of animal fats and salt. (2) The fact that natto contains no salt. (3) The high and uniform quality of commercial natto and its long shelf life, which has been extended by the use of refrigerated distribution from natto factories to households.

The majority of natto makers in Japan are small family businesses that make about 300 kg of natto a day. These companies distribute their fresh natto locally. However, there is a growing number of large factories that make more than 3,000 kg per day.

Annual consumption of natto in Japan is 760 gm per person. Until the 1950s, natto was made and consumed mostly in the northeastern region of Japan. This localization has recently changed due to the acceptability of natto in the rest of Japan.

In Japan, natto is eaten with thinly sliced leeks (*negi*), nori (a black, paper-thin sheet made of a sea vegetable), and mustard mixed together with a small amount of soy sauce, as a side dish for a bowl of cooked rice—typically for breakfast and/or dinner. Natto is also used as one ingredient in nori-wrapped sushi and in noodle soup. Address: Director,

Applied Microbiology Div., National Food Research Inst., Ministry of Agriculture, Forestry, and Fisheries, Tsukuba, Ibaraki, Japan.

1196. Picasso, Christian. 1986. Soybean in Burkina Faso—Agronomic studies and development prospects. In: S. Shanmugasundaram and E.W. Sulzberger, eds. 1986. Soybean in Tropical and Subtropical Cropping Systems. Shanhua, Taiwan: Asian Vegetable Research and Development Center. xv + 471 p. See p. 421-25.

• **Summary:** This country was formerly called Upper Volta. Soybeans were introduced for experimental studies in 1958 by IRHO in an attempt to diversify traditional cropping patterns. Experiments were established at two research stations—one in the central part of the country (Saria, rainfall 800 mm) and one in the southwest (Niangolo, rainfall 1,200 mm). In the 1970s, after suitable varieties had been identified, and following the successful extension of improved groundnut cultivars to small farmers in the vicinity of research stations, a similar attempt was made to popularize soybean.

“The crop was gradually accepted by small landholders. ‘Nere’ seeds (*Parkia biglobosa*) are used for making a fermented condiment known as ‘soumbala.’ The soybean cultivars that were distributed (black seed coats) looked much like nere, and could be prepared in the same way. This culinary use has become widespread, and some families prefer soybean to nere. The black seed coat is no longer a reason for preference; cream-colored seeds are equally acceptable.”

Note: This is the earliest English-language document seen (Jan. 2012) that mentions “soumbala” (also called soumbara or dawadawa), a condiment made from soybeans resembling natto.

Constraints: “In 1975, the Regional Development Organization (RDO) in the eastern part of the country attempted to promote soybean. The RDO’s intention was to train the farmers and then purchase their crops.

“A total of 4.5 tonnes of seed were distributed in 1976 and 25 tonnes in 1977. The RDO, however, did not concern itself with the sale of the product, and in 1977 found that the farmers had produced about 200 tonnes, most of which RDO could not purchase. The experiment was, of course, a disaster, and the following year soybean production dropped dramatically.

“Farmers have no particular objections to soybean, since it presents no basic agronomic problems, but marketing is a major problem.”

Future Development: “Recent events provide some hope for soybean production. A pilot soybean milk manufacturing unit with a capacity of 200 liters/hour should be operational by 1984. A factory with much greater capacity will be built if the first plant is successful.

“In addition, a hydroponic center is now operational.



From 1984 onwards it will require 250 tonnes of soybean for use as fish food.” Address: Institut de Recherche pour les Huiles et Oleagineux (IRHO), BP 1345 Ouagadougou, Burkina Faso.

1197. Pierson, M.D.; Reddy, N.R.; Odunfa, S.A. 1986. Other legume-based fermented foods. In: N.R. Reddy, M.D. Pierson, and D.K. Salunkhe, eds. 1986. *Legume-Based Fermented Foods*. Boca Raton, FL: CRC Press. [viii] + 254 p. See p. 219-31. Chap. 13. [43 ref]

• **Summary:** Contents: Introduction. Ugba. Inyu and Kecap. Waries. Kenima. Meitauza. Philippine Tao-si. Fermented cowpeas and chickpeas.

Tao-si is a fermented food made from soybeans in the Philippines. To make tao-si, soybeans are first soaked overnight at room temperature. The beans are then boiled for 1 hour, drained, and cooled. At room temperature, the soybeans are coated with either raw or roasted wheat flour and inoculated with *Aspergillus oryzae*, a mold. The beans are then spread on bamboo trays, covered with banana leaves, and incubated for 2-3 days in a warm place until the soybeans are overgrown with a mycelium of white mold. The mold-covered soybeans are immersed in a brine solution (18% w/v = 18 gm of salt per 100 cc of water) and heated to boiling to prevent further mold growth and to inactivate enzymes.

Note: Unlike most fermented black soybeans, tao-si does not undergo two sequential fermentations. Address: 1-2. Dep. of Food Science and Technology, Virginia Polytechnic Inst. and State Univ., Blacksburg, VA; 3. Dep. of Botany, Univ. of Ibadan, Ibadan, Nigeria.

1198. Reddy, N.R.; Pierson, Merle D.; Salunkhe, D.K. eds. 1986. *Legume-based fermented foods*. Boca Raton, Florida: CRC Press. viii + 254 p. Illust. Index. 26 cm. [585 ref]

• **Summary:** An overview with information on nutrition and processing of fermented soyfoods. Contents: 1. Introduction. 2. Soy sauce. 3. Miso. 4. Sufu. 5. Natto. 6. Tempe. 7. Fermented soybean milk and other fermented legume milk products. 8. Oncom (fermented peanut press cake). 9. Idli. 10. Dhokla and Khaman. 11. Dawadawa. 12. Papads. 13. Other legume-based fermented foods (Inyu, kecap, kenima, meitauza, Philippine tao-si). 14. Future of legume-based fermented foods. Address: 1-2. Dep. of Food Science & Technol., Virginia Polytechnic Inst. and State Univ., Blacksburg, VA; 3. Vice-Chancellor, Mahatma Phule Agricultural Univ., Rahuri, Maharashtra State, India.

1199. Reddy, N.R.; Pierson, M.D.; Salunkhe, D.K. 1986. Introduction. In: N.R. Reddy, M.D. Pierson, and D.K. Salunkhe, eds. 1986. *Legume-Based Fermented Foods*. Boca Raton, FL: CRC Press. [viii] + 254 p. See p. 1-3. Chap. 1. [5 ref]

• **Summary:** Contents: A two-page table titled “Legume-

based fermented foods,” which summarizes all foods discussed in this book, has 5 columns: Name of food, substrate, microorganisms involved, use of food, and areas (where made and used). For example. Natto: Soybeans. *Bacillus natto*. Cake as a meat substitute [sic, it is neither in cake form nor serves as a meat substitute]. Japan (northern part).

Note: Kenima should be spelled “Kinema.” “Kecap” is not a different food from “ketjap.” The latter is simply the old spelling. Address: 1-2. Dep. of Food Science and Technology, Virginia Polytechnic Inst. and State Univ., Blacksburg, VA.

1200. Sneath, P.H.A.; Mair, N.S.; Share, M.E.; Holt, J.G. eds. 1986. *Bergey’s manual of systematic bacteriology*. Vol. 2. Baltimore, Maryland: The Williams & Wilkins Co. xxiii + 1599 p. See p. 1105-1139. \*

• **Summary:** On these pages is a section on “Bacillus” by P.H.A. Sneath.

1201. Wang, H.L.; Fang, S.F. 1986. History of Chinese fermented foods. *Mycologia Memoir* No. 11. p. 23-35. Chap. 2. (C.W. Hesseltine and Hwa L. Wang, eds. *Indigenous Fermented Food of Non-Western Origin*. Berlin & Stuttgart: J. Cramer.) Previously published in 1981 in USDA Miscellaneous Publication FL-MS-333. [6 ref]

• **Summary:** Discusses the early history of numerous types of chu [ch’ü, qu] (similar to koji, with a substrate of wheat, barley, millet, and/or rice), chiang [jiang] (salted sauce), shi or tou-shi (fermented beans) [fermented black soybeans], chiang-you, tou-yu and shi-tche (the liquid from shi [fermented black soybean sauce]; “It is a very dark but clear liquid and was the most popular seasoning in the sixth century”), tou-fu-ru (fermented tofu or sufu), La-pa-tou (Mucor fermented beans), Mei-tou-tcha (Meitauza, fermented okara), tsu (vinegar), yan-tsai (salted vegetables).

The three main sources of early information on fermented soyfoods are: (1) *Shih chi* [pinyin: *Shiji* by Sima Qian] (90 B.C., historical record). (2) *Ch’i-min yao-shu* [pinyin: *Qimin yaoshu*, by Jia Sixie, AD 544, “Important arts for the people’s welfare”] (+6th century agricultural encyclopedia). (3) *Pen-ts’ao kang-mu* [pinyin: *Bencao gangmu*, by Li Shizhen, AD 1596, “The great pharmacopoeia”] (16th century botanical encyclopedia).

Concerning shi or tou-shi [fermented black soybeans]: The first written record “appeared in the *Shi-chi* (the historical records) written by Szuma Chien in the second century B.C., which stated that shi was sold next to salt, indicating shi was already a popular food seasoning.” In the *Qimin yaoshu* (6th century AD) the method of preparing shi is described in detail. Temperature is said to be the most important factor in making shi, and June was found to be the best month for preparing this fermented seasoning. A detailed description of the process is given.

The *Bencao gangmu* (16th century AD) described many types of shi made at different localities, and gave the medicinal use of each.

“In more recent times, shi can be classified into three general types.” (1) *Aspergillus oryzae* mold type, which is the traditional type, also known as tou-shi [douchi], and is the most common type, prepared as described above, but using pure cultures of *Aspergillus oryzae*. Today the fermentation is carried out at 25°C in wooden barrels. “In some areas, the washed, molded beans are mixed with 16-18% salt and fermented at 35°C for 30 days.” (2) *Mucor* mold type, which is usually made in Szechuan in wooden trays. The process is described. The mold is *Mucor racemosus* Fresenius. (3) *Bacillus* bacteria type, called shui-tou-shi [pinyin: shui-dou-chi], is probably the same product as natto in Japan [except that it is salted]. To make shui-tou-shi: Clean, soak, and boil soybeans until soft. Place in a cloth bag and cover with straw [an excellent natural source of *B. subtilis*]. After incubation for 1-2 days at 25-30°C the soybeans will be covered with viscous substances. The quality of the product is ascertained by the stickiness of the beans. Mix the sticky soybeans with minced ginger and salt, then pack tightly into jars, and age for one week. They are now ready to consume. “The organism responsible for this fermentation has been identified as *Bacillus* species.”

Note 1. Is the third type salted? Salt is apparently added after the 1st fermentation and before the 2nd. Thus, it would seem to be an intermediate form between douchi / tou-shi (fermented black soybeans, salted) and natto (unsalted). If it is not salted, it would seem to be Chinese natto.

Note 2. This is the only document seen (Jan. 2012) that mentions either shui-tou-shi or shui-dou-chi. Address: 1. USDA/NRRC, 1815 N. University St., Peoria, Illinois 61604; 2. Inst. of Microbiology, Academia Sinica, Beijing, China.

1202. Wang, H.L.; Hesseltine, C.W. 1986. Glossary of indigenous fermented foods. *Mycologia Memoir* No. 11. p. 317-44. Chap. 18. (C.W. Hesseltine and Hwa L. Wang, eds. Indigenous Fermented Food of Non-Western Origin. Berlin & Stuttgart: J. Cramer). [29 ref]

• **Summary:** The section titled “Fermented Legume Products” defines chao (Vietnamese fermented tofu), chiang-chu (Chinese koji), ch’ou-toufu and ch’ou-toufu-ru (fermented tofu), Damsuejang and doenjang (Korean miso), furu, sufu, hon-fan or red sufu (fermented tofu), in-shi (“Fermented black soybeans from China”), in-yu (Type of Chinese soy sauce made from black soybeans), kanjang (Korean soy sauce), kenima [sic, kinema], ketjap or kecap (Indonesian soy sauce from black soybeans), meitauza or mei-tou-cha (fermented okara), meju (maiju or maeju; Korean soybean koji), natto, oncom (onchom or oncom), see-iu (see-iew; Thai soy sauce made from whole soybeans); soy sauce, soybean paste, tahuri (tahuli; Filipino fermented

tofu. See sufu), tao-chieo (tao-jiao; Thai miso), taohu-yi (Fermented tofu from Thailand. See sufu), taokoan, tempe (many types), thua-kab (dry thua-nao), thua-merk (wet and cooked thua-nao), thua-nao (Thai natto), tosfu (see sufu), toufu-ru (fermented tofu), tsue-fan (tsui-fan, chee fan; fermented tofu).

Note 1. This is the earliest English-language document seen (Nov. 2011) that contains the term “Fermented black soybeans from China,” or that uses these terms to refer to *in-shi*.

Under “Fermented Cereal-Legume Products” we find: chiang, chiang-yu (chau-yu, Chinese soy sauce), fermented soybeans (fermented black soybeans), hamanatto, kochujang (kochu chang), miso, shoyu, tamari, taotjo (tao-tjo, tao dji; Fermented soybeans from Indonesia or Thailand [sic, No! *Tao-tjo* is Indonesian-style miso and *tao dji* are Indonesian fermented black soybeans]), tao-tjung or tou-chiang (chiang), tao-yu (tou-yu; Chinese soy sauce), tauco (taocho, taoco, taucho; Indonesian miso), tou-pan-chiang (Chinese fava bean miso), tou-shi (toushih; Chinese fermented black soybeans), toyo (Filipino soy sauce). Note 2. This is the earliest English-language document seen (March 2009) that uses the word “taocho” to refer to Indonesian-style miso.

Fermented Vegetable Products include: Chiang-tsai (chiang-tsay; Vegetables in China pickled in chiang or soy sauce or tien-mien-chiang), miso-zuke. Address: USDA/NRRC, 1815 N. University St., Peoria, Illinois 61604.

1203. *Toyo Shinpo (Soyfoods News)*, 1987. 90 byô Nama C M o 13 Kai. Zennôren ichi oku en senden jigyo [The National Natto Association’s ¥100,000,000 advertising campaign included thirteen live, 90-second television commercials]. Feb. 1. p. 3. [Jap; eng+]

• **Summary:** The Japanese National Natto Association has been conducting a big advertising campaign since August 1986. From October 3 to December 26, 1986, they ran commercials on TV in the mornings showing nutritional value comparisons between soybeans and natto, health and physical fitness benefits, recipes, etc. They have also been distributing 3 booklets: 1. Daisuki Natto (all-color, 16 pages, ¥100, NHK Enterprises K.K.), which contains natto recipes; 2. Natto Man (like Superman) (all-color, 16 pages, ¥15/copy); 3. A picture book for kids. Free, but you have to order 100 or more. Information on natto that had been displayed on the NHK Good Morning Health Special has also been distributed in flyer form.

1204. Flinders, Carol. 1987. Laurel’s Kitchen. *Washington Post*. Feb. 18. p. E3.

• **Summary:** A vitamin B-12 deficiency is a rare but very serious problem. “Another way to get vitamin B-12 is to eat tempeh or miso every day”—although neither is a completely reliable source. “Other fermented foods, such as natto and even shoyu, may contain B-12, but it shouldn’t be counted

upon.” Address: [California].

1205. Murata, K.; Kusakabe, I.; Kobayashi, H.; Akaike, M.; Park, Y.W.; Murakami, K. 1987. Studies on the coagulation of soymilk-protein by commercial proteinases. *Agricultural and Biological Chemistry* 51(2):385-89. Feb. [5 ref. Eng]

• **Summary:** 17 proteinases from microorganisms, plants, and animals were tested as coagulants for soymilk. Those which did coagulate soymilk were bromelain, papain, trypsin and proteinases from *Bacillus amyloliquefaciens*, *B. subtilis*, *B. polymyxa*, *Streptomyces griseus*, *S. caespitosus*, *Aspergillus oryzae*, *A. sojae*, *Endothia parasitica*, *Rhizopus* species, and *Mucor miehei*. Ineffective were rennin, pepsin, and proteinases from *Aspergillus saitoi*. Soymilk clotting activity fell as the pH rose from 5.9 to 6.7. Temperature optima for the enzymes varied from about 50°C for *Rhizopus sp.* to 85°C for *Bacillus subtilis* and *B. thermoproteolyticus* and as high as 95°C for papain. Address: Research Development Sect., Kibun Food Chemifa Co. Ltd., Takinogawa 7-38-15, Kitaku, Tokyo 114, Japan.

1206. *Toyo Shinpo (Soyfoods News)*, 1987. Shōwa rokujū nen no gyōshasū. Tōfu gyōsha 25,429 ken. Genshō keikō tsuzuku ga genshōritsu wa teika. Nattō wa 926 gyōsha (zennen hi 2.4% gen) [There were 25,429 tofu manufacturers in Japan in 1985. Although the number of manufacturers continues to decrease, the rate of decrease is slowing. There were 926 natto manufacturers (2.4% less than last year) in 1985]. March 21. p. 3. [Jap; eng+]

• **Summary:** The number of tofu manufacturers in Japan dropped in 1985 to 25,429. That is 603 less than last year (2.32% less). But the rate of reduction is also decreasing—from 3% to 2.1%. The number of natto manufacturers in Japan fell to 926. That is 23 less than last year (2.42% less). There were also fewer new tofu makers in the country than in previous years. Graphs in the article compare the number of new manufacturers with those who went out of business.

1207. Kiuchi, Kan; Taya, N.; Sulisty, J.; Funane, K. 1987. Shihan nattō-kin no bunri to dōtei [Isolation and identification of natto bacteria from market-sold natto starters]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 50. p. 18-21. March. [10 ref. Jap; eng]

• **Summary:** Seven bacterial strains were isolated from commercial starters made by 3 companies. Six strains were identified as *Bacillus natto*, a variety of *Bacillus subtilis*. One of the strains isolated from the natto starter made by company #2 consisted of *B. subtilis* which did not belong to *Bacillus natto*. Address: 2. Takano Foods Co. Ltd.; 3. National Biological Inst. of Indonesian Inst. of Sciences, Indonesia.

1208. Kuwahara, M.; Nakano, H. 1987. Soybean in Japan.

*Eurosoya* No. 5. p. 5-7. April. [1 ref. Eng]

• **Summary:** In 1984 Japan consumed 4,810,000 tons of soybeans. Of the total, 82% is used for oil and meal production, 17% for foods, and the rest (1%) as feed for livestock. 95% of the soybeans used are imported, mainly from the USA (92%) and China (7%). The soybeans from China and Japan, which are higher in protein and lower in oil, are used for traditional foods. Domestic production is small and these soybeans are expensive. They are processed to make tofu (38%), miso (24%), natto (10%), and other foods (11%), while the remaining 17% is used for home cooking.

Soybean breeding started in 1910 in Japan; pure line selection from many local varieties was the main method. After about 1930 cross-breeding became the main method. In 1935 soybean breeding started at the experiment stations of the Ministry of Agriculture, Forestry, and Fisheries (Norinsho). Today there are 5 such stations with a soybean breeding laboratory and 3-5 breeders per lab. From north to south they are Chuo and Tokachi in Hokkaido, Kariwano in Tohoku, Chushin in Nagano, and Kumamoto in Kyushu. Yet from 1950 to 1980 soybean yield increased only slightly, to 1.5 tonnes/ha from 1.3 tonnes. Japan's largest seeded soybean is Tanbaguro; 100 seeds weigh 70 gm. It is preferred for cooking. The smallest is Nattoshoryo; 100 seeds weigh 8-10 gm. It is traded at high prices for natto production.

For decades the Japanese government, for political reasons, has subsidized rice production. But after the late 1970s, when production far exceeded domestic consumption, the government decided to reduce rice acreage and promote the cultivation of other crops, especially soybeans, barley, and wheat in the drained paddy fields (converted upland fields), which accounted for 62% of the soybean cultivated area in 1985, totaling 134,000 ha. Address: Lab. of Soybean Physiology, National Agriculture Research Center, Tsukuba, Ibaraki 305, Japan.

1209. Fehr, W.R. 1987. Breeding methods for cultivar development. In: J.R. Wilcox, ed. 1987. Soybeans: Improvement, Production, and Uses. 2nd ed. Madison, Wisconsin: American Society of Agronomy. xxii + 888 p. See p. 249-93. Chap. 7. [145 ref]

• **Summary:** Contents. 1. Objectives of cultivar development: Seed yield, pest resistance, maturity, lodging resistance, plant height, seed size, seed quality, protein and oil quantity and quality, shattering resistance, resistance to mineral deficiencies and toxicities (e.g. iron deficiency chlorosis), resistance to herbicide injury. 2. Population development: Types of populations (two-parent population, multiple-parent, backcross), hybridization. 3. Inbred line development: Methods (pedigree, bulk, mass selection, single seed descent, early generation testing), comparison of inbreeding methods, number of inbreeding generations. 4. Inbred line evaluation: Selection before or during replicated

yield tests, replicated tests, resource allocation for yield evaluation, techniques for plot management (planting, end-trimming, harvest). 5. Breeder seed production: Methods of purification, timing of breeder seed production. 6. Commercial use of seed mixtures: Marketing of seed, seed yield, overcoming deficiencies of high-yielding cultivars, stability of performance, other considerations.

Concerning seed size: The seed size of widely grown soybean varieties ranges from about 12-18 gm per 100 seeds. Soybeans weighing less than 10 gm per 100 seeds are preferred for natto, whereas soybeans weighing more than 22 gm per 100 seeds are preferred for various food uses. Verde, a variety with green seeds that weigh 32 gm per 100 seeds was developed for processing as a canned or frozen vegetable. Prize, a yellow-seeded variety weighing 27 gm per 100 seeds, has been used for home gardens, and for making roasted soy flour and miso. Address: Iowa State Univ., Ames, IA.

1210. Kanno, Akishige; Takamatsu, Haruki. 1987. [Studies on natto. IV. Changes in the volatile components of natto during manufacture and storage]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 34(5):330-35. May. (Chem. Abst. 107:114495). [17 ref. Eng; jap]

• **Summary:** Acetoin and 2,3-butanediol were found to accumulate and reach a maximum in natto after 12 hours of fermentation, after which time these amounts decreased as a result of the action of microorganisms. Prior to this period, the level of citric acid, the major organic acid of soybeans, and glucose released from sucrose, decreased noticeably. Acetic acid increased gradually during the latter half of fermentation and showed irregular variations during storage. Propionic acid was detected from the middle of fermentation and its increase was affected by storage temperature. 3 branched-chain fatty acids (iso-butyric, 2 methylbutyric, and 3-methylbutyric acids) were detected after 12 hours of fermentation and increased thereafter. During storage at 25 degree C, contents of these acids increased markedly. However no such change was observed during storage at 5 or 15 degree C. Address: Asahi Shokuhin Co. Ltd., 180-2 Wado, Ushibori-machi, Namekata-gun, Ibaraki, 311-24, Japan.

1211. Katagiri, Mitsuaki; Shimizu, S.; Kaihara, H.; Katagiri, C. 1987. [Determination of esterified and free carboxylic acids in the various kinds of natto by gas chromatography]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 34(5):305-08. May. (Chem. Abst. 107:174685). [9 ref. Jap; eng]

• **Summary:** Free and esterified fatty and organic acids in various samples of natto (9 types of itohiki-natto and 6 types of tera-natto [fermented black soybeans]) were determined by a modified standard method and compared with those of common miso. Ethyl esters of fatty acids present in large

quantities in miso were not detected in itohiki-natto, but found in small quantities in tera-natto. Lactic acid was the dominant organic acid in hama-natto, (470.1 mg/100 gm) and in tera-natto (26.2 mg/100 g) and was not detected in either itohiki- or hoshi-natto. Average contents of the major volatile organic acids in itohiki-natto were (mg/100 gm): acetic acid, 124.7; propionic acid, 28.4; iso-butyric acid, 44.1; and iso-valeric acid, 46.7. The last 2 acids, which gave unfavorable odor at higher concentrations, were found in small amounts in hama-natto and tera-natto. Address: Dep. of Domestic Science, Iida Women's Junior College, Matsuo 610, Iida-shi, Nagano 395, Japan.

1212. Kim, Bok-Ran; Han, Y.B.; Park, C.H. 1987. [Changes of free sugar and free amino acid during the natto fermentation used by *Bacillus subtilis* S.N.U. 816]. *Hanguk Nonghwa Hakhoe Chi (J. of the Korean Agricultural Chemical Society)* 30(2):192-97. June. (Chem. Abst. 107:19743). [39 ref. Kor; eng]

• **Summary:** The free sugars examined were fructose, glucose, sucrose, and maltose. Remarkable increases in the levels of fructose and glucose were observed after 4 hours of fermentation. After that, however, their contents were reduced to a very low level as fermentation continued. The sucrose content dropped dramatically to about the 10% level and stayed low thereafter.

The free amino acid content of natto during 20 hours of fermentation was twice as high as that of unfermented soybeans.

Sensory evaluation showed that 20 hours of fermentation at 43°C produced the best quality natto based on taste, odor and color.

Contains 5 tables and 1 graph. Address: 1-2. Dep. of Home Economics Education, Korea Univ.; 3. Sampyo Foods Co., Ltd. Lab. All: Seoul, Korea.

1213. Torii, Yasuko. 1987. New developments with tempeh in Japan (Interview). Conducted by William Shurtleff of Soyfoods Center, July 1. 2 p. transcript.

• **Summary:** Torigoe-Seifun stopped making tempeh in mid-1987. They had a hard time popularizing it. Marusan's tempeh is not selling well. They, too, are thinking of stopping. Mr. Kanasugi and the Natto Assoc. are trying to cooperate with Marusan. They suggest selling "tempeh miso," made as follows: Mix 10 kg tempeh, 10 kg barley koji or rice koji, and 1 kg salt. Grind in a meat grinder and let stand at room temperature in the summer for 1 month. The result is a sort of Finger Lickin' Miso. Barley koji works best, and the resulting tamari is delicious. Mr. Kanasugi hopes some miso maker will make this. Only Mr. Kanasugi is doing tempeh research. He makes this miso in his restaurant daily. He also makes a spread like peanut butter. Mr. Ose is still making tempeh but his business, Udai, is not doing well. No one is left at the Ministry of Agriculture with

an interest in tempeh: Mr. Katoh went to work with FAO in Rome and Ohta went to Showa Seiyu.

Why did tempeh fail to catch on in Japan? 1. It was poorly marketed. 2. The ads and Torigoe aimed at the older generation who still know how to deep fry foods. 3. It is not clear whether the attempted tie-in with natto was helpful or harmful. Natto is a convenient fast food. Now tempeh is not even sold at Natural House, the natural foods supermarket. Organic soybeans from Living Farms are now widely used in Japanese miso and natto. Address: Kamitsuchidana 324, Ayase-shi, Kanagawa-ken 252, Japan. Phone: 0467-76-0811.

1214. Ito, Tetsuo; Sugawara, E.; Sakurai, Y.; Takeyama, S.; Uchizawa, H.; Odagiri, S. 1987. Nattô-kin ni yoru pirajin-rui seisei no baichi sosei ni tsuite [Cultural media for production of pyrazines by a commercial natto bacillus (*B. natto*)].

*Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 61(8):963-65. Aug. [9 ref. Jap; eng]

• **Summary:** When natto bacillus was cultured on extracts of cooked soybeans (basal medium), traces of pyrazines were produced, though cell propagation proceeded moderately. A considerable quantity of pyrazines (403 µg/L of alkylpyrazines) was produced on a basal medium containing 1% glucose + 1% sodium glutamate, versus 26 µg/L of pyrazines in media containing only glucose. When 0.5% urea was used as the source of nitrogen, only 51 µg/L of pyrazines were detected in spite of rather high cell propagation levels. Thus urea inhibited pyrazine production. Address: 1&3-6. Dep. of Agricultural Chemistry, Iwate Univ., Ueda; 2. Iwate Prefectural Morioka Junior College, Sumiyoshi. All: Morioka 020, Japan.

1215. *Toyo Shinpo (Soyfoods News)*, 1987. 61 nendo no tôfu shôhi tôkei [Tofu consumption figure in 1986 is 5.29% lower than last year. Natto consumption is up]. Sept. 11. p. 4. [Jap; eng+]

• **Summary:** This is the first time in 23 years that tofu consumption per family per year has gone down 2 years in a row. In 1987, the Japanese people bought the least amount of tofu in 10 years. Naha (Okinawa, Japan) was first in the amount of household income spent on tofu, while Morioka was the top in the number of cakes sold per family (118 cho). The top selling location for deep-fried tofu pouches and burgers (*aburage* and *ganmo*) was Fukui while sales dropped in Kobe.

Natto, on the other hand, reached the highest number of packets bought per family in history. In Mito, families spent an average of ¥5700 on natto in 1987—a new record. Included in the article are two graphs giving figures of how much tofu per family per year was bought in the period 1977-1987, and how much tofu was bought per family per month in the period 1985-1987.

1216. *Toyo Shinpo (Soyfoods News)*, 1987. Zenkoku shuyô

toshi issetai atari no nenkan kônyû kingaku oyobi sûryô (1986–Showa 61 nen) [Quantities of soyfoods purchased per household in major Japanese cities in 1986]. Sept. 11. p. 5. [Jap; eng+]

• **Summary:** The top ten cities for tofu consumption and the number of cakes (*cho*) sold per household in 1986:

1. Morioka 117.94; Toyama 113.10; Fukushima 109.30; Tokushima 104.82; Tottori 102.93; Matsue 100.36; Yamaguchi 99.26; Aomori 98.87; Kagoshima 98.40; Matsuyama 96.68.

The top ten cities for natto and the amount spent per capita in 1986: Mito, ¥5,705; Fukushima, ¥4,168; Utsunomiya, ¥4,040; Aomori, ¥3,874; Morioka, ¥3,742; Sendai, ¥3,372; Akita, ¥3,335; Maebashi, ¥3,197; Yamagata, ¥2,775; Nagano, ¥2,650.

1217. *Ie no Hikari*. 1987. Mamenoko osusume no nattô ryôri [Natto dishes recommended by the Mamenoko restaurant]. Sept. p. 68-70. [Jap]

• **Summary:** This restaurant, specializing in natto and tempeh cookery, is run by Mr. Goro Kanasugi of the Japan Natto Assoc. The restaurant's cute name means "Child of the Bean."

1218. Snyder, Harry E.; Kwon, T.W. 1987. Soybean utilization. New York, NY: Van Nostrand Reinhold Co. xii + 346 p. Illust. Index. 23 cm. An AVI Book. [381 ref]

• **Summary:** Contents. Preface. 1. Production, marketing, and sources of information: Introduction, agricultural production, marketing, sources of information. 2. Morphology and composition: Morphology, chemical composition. 3. Processing of soybeans: Preparation, flaking, expellers, solvent extraction, oil refining, protein products. 4. Quality criteria for soy products: Protein and oil products. 5. Functional properties of soy proteins: Interactions of soy proteins with water, interactions of soy proteins with lipid, foaming, commentary on functionality. 6. Nutritional attributes of soybeans and soybean products: Inherent attributes of soybeans, changes due to processing.

7. Oriental soy food products: Traditional nonfermented soybean food products, traditional fermented soybean food products. 8. Soybean-supplemented cereal grain mixtures: Protein-rich food mixtures containing soy flours, composite flours containing soy flour, cereal blends containing soybeans. 9. Soy protein food products: Baked goods, meat products, dairy products, other foods containing soy protein. 10. Soybean oil food products: Salad and cooking oils, mayonnaise, and prepared salad dressings, shortenings, margarines and related products, soybean lecithin products. 11. Grades, standards, and specifications for soybeans and their primary products: Grades of soybeans, specifications for soybean meals and flours, trading specifications for soybean oils, specifications for lecithins, standards for the use of soy protein products in other foods. References in

each chapter. Glossary.

This book is well written (though largely a repetition of previous works) in the area of modern soy protein products. It is weak and poorly researched in the area of “Oriental Soy Food Products,” which comprises only 1 chapter (22 pages) of the total, making the book unbalanced. The author of this chapter seems to be almost completely unaware of the many major developments in the Western world during the past 10 years.

Note the following Korean soyfood terms: Fresh soybean = Put Kong. Toasted soy powder = Kong Ka Ru. Soy sprouts = Kong Na Moal. Soymilk = Kong Kook or Doo Yoo. Yuba (Soymilk film) = no name. Tofu (Soy curd) = Doo Bu. Tempeh (Fermented Whole Soybeans) = no name. Natto = Chung Kook Jang. Soy sauce = Kan Jang. Miso (Soy Paste) = Doen Jang. Fermented tofu (Fermented Soy Curd) = no name. Fermented okara (fermented soy pulp) = no name.

Note: This is the earliest English-language document seen (Dec. 2005) that uses the term “Toasted soy powder” to refer to roasted soy flour. Address: 1. Prof., Food Science Dep., Univ. of Arkansas, Fayetteville, AR; 2. Principal Research Scientist, Div. of Biological Science & Engineering, Korea Advanced Inst. of Science and Technology, Seoul, South Korea.

1219. *Toyo Shinpo (Soyfoods News)*, 1987. Ichi nichu 1000 shoku mo deru nattô ryôri. Nattô ryôri senmon ten “Mamenoko” [One thousand natto dishes sold daily. Natto cookery specialty shop—Mamenoko]. Oct. 11. p. 2. [Jap; eng+]

• **Summary:** Goro Kanasugi is president of Kanasugi Shokuhin Kogyo Ltd. at Shimomachi 3-6, Omiya-shi, Saitama-ken, Japan. Phone 0486-41-1425. He opened this restaurant, Mamenoko, in 1975. His son is currently running the business. The natto menu consists of natto croquettes, natto gyoza (pot stickers), tororo natto soup, yamaimo no natto age (fried natto with glutinous yam), maguro no natto kake (with tuna) and ika natto (natto with squid). He serves 1,000 of these dishes a day at the restaurant. He also has a health foods shop next to the restaurant and sells second generation tempeh products such as brown rice bread with tempeh, dango, croquettes and kabayaki teishoku. About 10 of these items are sold daily. His tempeh saka manju, which sells 500-600 (sometimes 1,000) cakes a day, goes for 60 yen per cake. The article includes a photo of the shop.

1220. Sumi, Hiroyuki; Hamada, H.; Tsushima, H.; Mihara, H.; Muraki, H. 1987. A novel fibrinolytic enzyme (nattokinase) in the vegetable cheese Natto: a typical and popular soybean food in the Japanese diet. *Experientia* 43(10):1110-11. Oct. 15. [16 ref. Eng]

• **Summary:** A study of protease activity in natto showed that it contained an enzyme that hydrolyzed fibrin, a white insoluble fibrous protein formed from fibrinogen (a globulin

produced in the liver) by the action of thrombin, esp. in the clotting of blood. The novel enzyme, extracted by saline solution, was named nattokinase (pronounced not-toe-KAI-nase). The use of natto as a folk remedy for heart and vascular diseases is discussed with reference to the strong fibrinolytic activity it contains, and the potential of nattokinase for oral fibrinolytic therapy is considered.

Note 1. This is the earliest English-language document seen (Jan. 2012) that contains the word “nattokinase” or the word “fibrinolytic.” Nattokinase is a strong fibrinolytic enzyme found in natto. Fibrin is a fibrous protein involved in the clotting of blood. It is a fibrillar protein that is polymerised to form a “mesh” that forms a hemostatic plug or clot (in conjunction with platelets) over a wound site (Source: Wikipedia March 2009). According to www.askdrgarland.com (accessed Dec. 2011):

“Nattokinase was discovered in 1980, by Dr Hiroyuki Sumi, who was working at the Chicago University Medical School. He was testing 172 different foods for their ability to promote healthy circulation, and Nattokinase did the job better than any other substance he was testing.

“Since then, additional research has been done on Nattokinase, including 17 published studies in Japan and here in the U.S. The results have been dramatic to say the least.

“But to fully understand the significance of Nattokinase, you need to first understand ‘blood clotting.’ Blood clotting is a normal and necessary process, it’s what stops the bleeding if you cut your finger for instance.

“Our body produces compounds that make blood clots; one of the most important is called ‘Fibrin’. Fibrin is made up of sticky protein fibers which look like a tangled spider’s web.

“Fibrin’s job is to stick to the blood vessel walls and act like a net, form a lump or plug that stops the bleeding. Fibrin is also what determines the viscosity, or thickness of blood throughout our entire circulatory system.

“Normal Fibrin levels will give you normal blood flow.

“There is only one enzyme that breaks down Fibrin—an enzyme called ‘Plasmin.’

“Remember, Fibrin is what’s forming a ‘web’ that stops blood from flowing—so by breaking down Fibrin, Plasmin dramatically increases blood flow and thus brings down blood pressure.

“Unfortunately, Plasmin production declines rapidly as we age. If the drug companies could ‘bottle’ Plasmin, they would have a staggering gold mine in their hands. They can’t. But Mother Nature can.

“Nattokinase is ‘Mother Nature’s Plasmin’ and works dramatically to support healthy circulation in two distinct ways.

“First, Nattokinase is identical to Plasmin, so it can break down Fibrin!

“Second, Nattokinase enhances your body’s natural

production of Plasmin, further helping to break down the Fibrin.” Address: Dep. of Physiology, Miyazaki Medical College, Miyazaki 889-16, Japan.

1221. Okafor, N. 1987. Upgrading local technologies of food processing with emphasis on fermented foods: the case of oils and fats. In: O.C. Aworh, ed. 1987. Proceedings 11th Annual Conference of the Nigerian Institute of Food Science and Technology (NIFST). Lagos, Nigeria: NIFST. See p. 61-74. Held 25-29 Oct. 1987 at Port Harcourt, Nigeria. \*

1222. Bradner, Norman. 1987. Soybeans for the food market. *Seed World (Des Plaines, Illinois)*. Oct. p. 44.

• **Summary:** Thailand imports nearly 100,000 tonnes/year of soybeans for food use. Japan imports 65,000 to 70,000 tonnes of small beans to make natto. Natto beans can be less than 5 mm in diameter and have a yellow cotyledon and hilum. For tofu, soymilk and miso, importers want high protein, low oil, maximum water soluble proteins, low phytate, high 11S protein fraction, large seed size and high sugar content. But a variety judged good one year can be deemed unsuitable the next. Environmental conditions during seed development play a significant role in determining the final chemical composition. Address: Pulse Breeder, King Agro, Inc., Chatham, Ontario, Canada.

1223. *INTSOY Newsletter (Urbana, Illinois)*. 1987. Cooperative efforts in Nigeria aim to increase soybean use across Africa. No. 37. Oct. p. 3-4.

• **Summary:** In Nigeria soybean production has more than doubled in the past 5 years in response to the growing demand and the shortage of foreign exchange needed to import soybean meal. The 1987 crop is estimated to be at least 125,000 tonnes, in part because of the current high cash price. In Nigeria, much of the soybean production is concentrated in the northern states of Benue and Kaduna.

The most widely consumed soyfood in the country is soybean dawa-dawa, a fermented and dried product that is sold as a wafer. Also known as iru in Yoruba-speaking areas, it is traditionally made from the seed of the locust bean tree. According to a 1984 survey by IITA, about 60% of the dawa-dawa producers use soybeans and another 20% use a combination of soya and locust beans. Dawa-dawa is used to flavor soups, stews, and sauces.

IITSOY is working with IITA on ways to expand soybean use and processing throughout Africa. Another method of using the dawa-dawa wafer is to pound the dry wafer and add it to dishes as a powder. In the soybean marketing center of Kafanchan in southern Kaduna, soybean dawa-dawa is purchased by traders who sell it throughout Nigeria and as far away as Cameroon, Chad, and Niger.

IITA staff last year held utilization training sessions that attracted more than 180 participants in Ondo state. Other training sessions at 34 villages in Oyo state and at the

Kersey Children’s Home near Ogbomosho also drew strong attendance. The children’s clinic at the Kersey Home started using soymilk and soy-fortified weaning foods to combat the childhood malnutrition known as kwashiorkor. The clinic now uses almost two tons of soybeans a month. By 1986, more than 3,000 farmers in Oyo State were growing soybeans on small plots totaling 1,000 hectares.

Note: This is the earliest English-language document seen (Jan. 2012) that contains the term “dawa-dawa” (hyphenated) in connection with soybeans (one of two documents); it is a close relative of natto.

Soy meal for the rapidly growing poultry industry is now the most important commercial soy product. Some companies, however, are moving into the production of soymilk, high-protein soyfoods, and edible oil. Both Food Specialties Limited and Smalltree Nigeria Limited are increasing the use of soybeans in infant and breakfast cereals. More than 30 businesses and individuals contacted IITA for technical advice on opening or expanding soybean processing operations. Extrusion cooking in particular has recently had an increased impact in Nigeria. At least four INSTA PRO extruders have allowed expanded production of poultry feed and full-fat soy flour for human consumption. The new local processing capacity has been especially important because of government restrictions on importing soy products.

Expansion of soybean use in Nigeria will require the introduction of new products, processes, and equipment adaptable to African village-level operations.

1224. Ontario Ministry of Agriculture and Food. 1987. Soybean buyers mission from Japan, Hong Kong, Malaysia, Singapore, October 10-20, 1987. Toronto, Ontario, Canada: Ontario Ministry of Agriculture and Food. 23 p. 30 cm. Saddle stitched. [Eng]

• **Summary:** Contents: Mission members (with a photo of each). Itinerary. Japanese market for edible soybeans. General uses of edible soybeans in Hong Kong, Malaysia and Singapore. List of major importers in Asia (by country). Ontario soybean suppliers. Role of the Ontario Soya-Bean Growers Marketing Board (Chatham, Ontario).

This conference, which took place in Toronto, Chatham, and Harrow, Ontario, Canada, was sponsored by OMAF in Toronto. On the mission were 6 buyers from Japan (Takeya Miso Co., Asahi Industries [tofu maker], Takano Foods Co. [natto maker], Dah Cong Hong, Wako Shokuryo Co., and Gomei Shoji Co. [the last 3 is each an importer and wholesaler]), 2 from Hong Kong (Amoy Industries Ltd., and Chung Hing Co.), 3 from Malaysia (Sin Yong Huat Enterprises Sdn. Ltd, Yeo Hiap Seng (Malaysia) Ltd., and Chop Lee Kit Heng), and 2 buyers from Singapore (Eng Huat (S) Ltd. and Chop Hin Leong). Mike Hojo of OMAF/Tokyo was the mission leader.

The Japanese soybean market is about 5 million tons

a year. Of this: Oil crushing 4,036,000 tons. Food 849,000 tons (17% of total), and feed (not crushed) 70,000 tons. From 1982 to 1986 domestic Japanese soybean production has decreased from 168,000 tons to 147,000 tons, while imports have increased from 4,344,000 tons to 4,857,000 tons. Demand for food soybeans has increased from 803,000 tons to 849,000 tons. Tofu, miso, and natto account for more than 94% of the total utilization of edible soybeans, roughly as follows: Tofu 500,000 tons, miso 200,000 tons, natto 100,000 tons.

In 1986 some 89.9% of Japan's soybean imports came from the USA, followed by China (6.7%), and Brazil (2.65%). That year the least expensive soybeans came from Brazil (US\$219.86/ton), followed by USA (\$221.36), China (\$236.06), and Canada (\$277.50). Note that Canadian soybeans are 25.3% more expensive than those from the USA. Chinese and Canadian soybeans are most widely used to make foods. Large Chinese soybeans are used to make tofu, medium sized for miso, and small for natto. Of the soybeans imported from the USA, 80-85% are imported from oil crushing because of their high oil content. The remaining 10-15%, or approximately 700,000 tons are food soybeans from Iowa, Ohio, or Michigan. Called "IOM" soybeans, they are used mainly to make tofu. Brazilian soybeans have a high oil content and are used for oil crushing only. The ocean freight cost for a 20-foot container shipped to Tokyo is as follows: USA west coast \$1,000. Toronto, Canada \$1,800. USA East Coast \$2,000. Brazil \$2,100. Argentina \$2,500. But a large percentage of regular soybeans are loaded directly into ships, and travel at lower freight rates. Exports of food soybeans from Canada to Japan rose from 10,000 tons in 1979 to 26,000 tons in 1986, while those from China rose from 267,000 tons in 1979 to 323,000 tons in 1986.

Very detailed preferred characteristics are given for soybeans to make miso (6 characteristics), natto (5), and tofu (5). Canadian soybeans are recognized as superior to Chinese and American soybeans for food use. This is one reason they command a relatively higher price.

Hong Kong imports 28,100 tons/year of soybeans, and 63% of these come from Canada, followed by China (35%), and the USA (1.8%). Malaysia and Singapore import 124,800 tons/year, and 53% of these come from the USA, followed by Canada (31.7%), and China (8.2%). Most of the food soybeans in Malaysia and Singapore are used to make soymilk and tofu.

Soymilk: Vitasoy dominates the market in Hong Kong, whereas in Malaysia and Singapore the leading manufacturers are Yeo Hiap Seng, Cold Storage, Lam Soon, and Nestle. Soymilk consumption is increasing in these 3 countries, and in neighboring countries. Soymilk makers believe there are four requirements for their products' success: It must taste good, must be priced competitively with soft drinks, must be perceived as a health food, and must be marketed properly.

Bean curd sheets and sticks [yuba] are very common snacks and dishes in Hong Kong, Malaysia, and Singapore. Manufacturers consider only Chinese and Canadian soybeans for these products. Canadian soybeans produce whiter soymilk and thus whiter yuba. However the larger size of Chinese soybeans results in a larger yield. Manufacturers normally blend 60% of Canadian soybeans with 40% of Chinese soybeans to obtain a higher output of whiter sheets.

Major Japanese soybean importers include: Da Chong Hong (Japan) Ltd., Gomei Shoji Co. Ltd., C. Itoh & Co. Ltd., Mitsubishi Corp., Kanematsu-Gosho Ltd., Nichimen Corp., Marubeni Corp., Mitsui & Co. Ltd., Nissho Iwai Corp., Okura & Co. Ltd., Toyo Menka Kaisha Ltd., Wako Shokuryo Co. Ltd. Address: Ontario, Canada.

1225. Root, W.R.; Oyekan, P.O.; Dashiell, K.E. 1987. West and Central Africa: Nigeria sets example for expansion of soybeans. In: S.R. Singh, K.O. Rachie, and K.E. Dashiell. eds. 1987. Soybeans for the Tropics. New York: John Wiley & Sons. xx + 230 p. See p. 81-85.

• **Summary:** While focusing on developments in Nigeria, this interesting account also describes developments with production and utilization in Zaire, Cameroon, Ghana, Ivory Coast, Senegal, Burkina Faso, Togo, and Benin.

Nigeria is the largest producer of soybeans for food use in West and Central Africa. Zaire, Cameroon, and Ghana also produce and consume soy beans. Soybeans may be the most practical means of relieving kwashiorkor (protein-calorie malnutrition), which is increasing in prevalence among young children in the densely populated humid tropics... The successes experienced by people introducing food use of soybeans into villages in West and Central Africa have been encouraging

Nigeria: As the largest producer of soybean, Nigeria also has the most extensive research programme. In 1908 soybeans were first introduced to Nigeria, but the first successful cultivation was in 1937 with the variety Malayan, which was used for commercial production in Benue State. Since then, many small-scale farmers in this part of south-central Nigeria have incorporated soybean in their cropping system. Less important areas of production are in southern Kaduna State and in the Federal Capital Territory and adjacent Niger State [in Nigeria]. Large-scale farmers, particularly in the guinea savanna, on the Jos Plateau and in the derived savanna of Oyo State, have recently become interested in soybean production.

Before Nigeria's civil war [1967-1970, Biafra], all the soybeans produced in the country were exported; now almost all the local production is used for 'dawa-dawa,' a traditional condiment made and sold by women operating small businesses in southern Kaduna State.

Since Nigeria's recent ban on imports of vegetable oil, some mills in the country are turning to soybeans as a source of edible oil.



The present expansion of soybeans in Nigeria has been founded on years of research. In the mid-1960s, the Institute for Agricultural Research (IAR) started a breeding programme for soybean and in 1983 initiated the release of two lines from a cross between Malayan and Clemson Non-shattering.

In 1980, soybean scientists in Nigeria adopted a nationally coordinated approach to soybean research that was subsequently endorsed by the federal government.

Four major research institutes—the Institute of Agricultural Research and Training, the National Cereals Research Institute, IAR and IITA—carry out the bulk of Nigeria's soybean research. The coordinated research projects have been reported elsewhere by Oyekan.

Note: This document contains the earliest date seen for soybeans in Nigeria (1908). Unfortunately the source of the information is not cited.

Zaire: Like Nigeria, Zaire has a history of soybean production by indigenous farmers. Soybeans were introduced and promoted first by missionaries before the nation won independence, and they are now considered a medicinal food to prevent and cure the wasting effects of kwashiorkor.

For the past 6 years, researchers from l'Office National de la Recherche et du Développement in Zaire, with the cooperation of scientists from AID (the United States Agency for International Development) have conducted a breeding program in three stations and have identified at least two improved varieties suitable for different regions of the country. Yields of experimental lines have surpassed 2.5 tonnes per ha in research trials.

Cameroon: Research on soybean in this country, where the crop was reportedly introduced in 1924 (Numfor, 1983), focuses not only on varietal development and testing but also on utilization and extension.

Research on utilization and extension has focused on increasing industrial and household use of soybeans. At last report, the low price for soybean deterred its commercial production, but homemakers, introduced to the crop through demonstrations, had begun to accept it.

“Ghana: Published research on soybeans in Ghana dates from at least the 1950s, and local farmers in the north grow the crop for home use.” Homemakers grind the beans into flour and use them in various local dishes.

Côte d'Ivoire [Ivory Coast]: In 1978 Côte d'Ivoire began a project in cooperation with scientists in Brazil to develop 2,000-ha seed farms for soybeans and maize at four sites in the country (derived savanna to northern guinea savanna).

“Senegal: For the past 15 years [i.e. since 1972] IRAT [Institut de Recherches Agronomiques Tropicales] has conducted a breeding program as well as research on agronomic practices for soybeans in Senegal, including suitable strains of rhizobia for inoculant. Recently, the research effort has been taken over by l'Institut Sénégalais de Recherche Agricole. Lines from this breeding program

have been successful in Côte d'Ivoire, Togo, and Cameroon. Testing in Senegal has focused on the region of the Senegal River, where trials have yielded good results. Yet few local farmers are growing soybeans.”

Other countries: In Burkina Faso, in 1958, soybean cultivars were introduced for experimental studies; after suitable varieties had been identified, efforts to popularize the crop began in the 1970s (Picasso, 1985). Togo and Benin have also identified suitable soybean varieties and have begun extension programs for the crop.

The future: Nigeria offers the best example in Africa of the potential for soybean production and use. The country has dramatically increased production from an estimated 30,000 ha in 1983 to 110,000 ha in 1986. The increase resulted from: (1) Government policies to produce food locally rather than import it. (2) Research to develop improved varieties and practices for all the agroclimatic zones in the country. (3) Emphasis on developing recipes that substitute or incorporate soybeans in traditional foods. (4) Willingness of local manufacturers to use soybeans in baby foods, vegetable oils and animal feeds. (5) Promotion of soybeans by organizations such as the river basin development authorities, agricultural development projects, hospitals, schools and local governments.

The rapid increase in production is expected to continue for many years. By 1996, Nigeria should have at least 1 million ha being cultivated with soybeans. Address: 1&3. International Inst. of Tropical Agriculture (IITA), PMB 5320, Ibadan, Nigeria; 2. Obafemi Awolowo Univ., Inst. of Agricultural Research and Training, Moor Plantation, Ibadan, Nigeria.

1226. Thompson, Keith. 1987. Jacob Hartz Seed Co. (Interview). *SoyaScan Notes*. Nov. 4. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Hartz was purchased by Monsanto in April 1983. They have been doing research on soybeans suited for soyfoods for 10 years. The director of research Curtis Williams (formerly at Louisiana State Univ. for 6 years) began in the mid-1970s to develop a very popular natto variety, that was released in 1980. Proprietary varieties for seed were first released in 1984. Univ. of Illinois and Iowa State are also doing food bean research. Soybean production in the South has shrunk 46% in the last 6 years, to 12 million acres from 22 million. A soybean containing no trypsin inhibitor was developed 2-3 years ago but there has not been much interest in it.

There are three lipoxigenase enzymes: L1, L2, and L3. There is a Japanese patented process for removing both L2 and L3, using backcrossing. Hartz has lines that are free of L1 or L2 or L3 or L1 + L3. Lipoxigenase removal seems to offer big promise for improved soymilk and tofu beans. Hartz is the only commercial seed breeder in the U.S. doing work on maturity group IX and X, now that Hinson has

closed down his tropical variety development in Florida. Hartz has a global outlook. He is sorry that INTSOY is no longer doing varietal development; they were a great source of information. Daylight insensitive is also called “juvenile characteristic.” It takes 1 bushel of seed to plant an acre of soybeans. Address: Food and Export Manager, P.O. Box 946, Stuttgart, Arkansas 72160.

1227. Kiuchi, Kan; Yamamoto, Kazuya; Hunane, Kazumi; Mori, Yutaka. 1987. Nattô-kin no kuen-san riaaze [Citratelyase of natto bacteria]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 51. p. 44-47. Nov. [7 ref. Jap; eng]  
Address: 1, 3-4. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 2. Eishoku Co., Ltd.

1228. Murata, Katsumi; Kusakabe, I.; Kobayashi, H.; Kiuchi, H.; Murakami, K. 1987. Selection of commercial enzymes suitable for making soymilk-curd. *Agricultural and Biological Chemistry* 51(11):2929-33. Nov. [5 ref. Eng]  
• **Summary:** Soymilk-clotting efficiency was relatively high for proteinases originating from *Bacillus amyloliquefaciens*, *Bacillus subtilis*, *Aspergillus oryzae*, *A. sojae*, *B. thermoproteolyticus* and bromelain, but low in those of *Endothia parasitica*, *Rhizopus sp.*, *Mucor miehei*, papain and trypsin. Of the enzymes investigated, proteinases showing high proteolytic activity to soymilk-protein also exhibited high soymilk-clotting efficiency. Such coagulation of soymilk-protein increased with the addition of calcium chloride or magnesium chloride to the soymilk. Address: 1,4-5. Research Development Section, Kibun Food Chemifa Co. Ltd., Takinogawa 7-38-15, Takinogawa 7-chome, Kita-ku, Tokyo 114, Japan; 2-3. Inst. of Applied Biochemistry, Univ. of Tsukuba, Sakura-mura, Niihari-gun, Ibaraki 305, Japan.

1229. Taira, Harue; Suzuki, N.; Tsukamoto, C.; Kainuma, Y.; Tanaka, H.; Saito, M. 1987. Kokusan daizu no hinshitsu XV. Nattô-yô kotsubu daizu no kakô-sei to nattô no hinshitsu [Quality of soybean seeds grown in Japan. XV. Suitability for natto processing of small seeded cultivars and quality of the natto]. *Shokuhin Sogo Kenkyujo Kenkyu Hokoku (Report of the National Food Research Institute)* No. 51. p. 48-58. Nov. [23 ref. Jap; eng]  
• **Summary:** Thirty samples of small seeded soybean varieties “were tested for their chemical composition, suitability for natto processing, and quality of natto produced.” Address: 1. National Food Research Inst. (Shokuhin Sogo Kenkyujo), Kannon-dai 2-1-2, Yatabe-machi, Tsukuba-gun, Ibaraki-ken 305, Japan; 2-3. Taishi Shokuhin Kogyo Ltd., Towada, Aomori prefecture, Japan.

1230. Hiyoshi, Hideaki. 1987. Nattô borantia hôkoku. Naijeria de nattô suupu ga kohyô datta [Report of a natto

volunteer. In Nigeria, natto soup was popular]. *Daizu Geppo (Soybean Monthly News)*. Dec. p. 26-29. [4 ref. Jap]  
• **Summary:** This sophomore man at Rikkyo University went to Nigeria and taught the people about natto. Address: Rikkyo Daigaku, Ninen-sei.

1231. Carter, Thomas E., Jr. 1987. Genetic alteration of seed size: Breeding strategies and market potential. In: Dolores Wilkinson, ed. 1987. Proceedings of the 17th Soybean Seed Research Conference 1987. See p. 33-45. [21 ref]  
• **Summary:** Contents: Introduction. Soyfood market size. Soyfood market trends—short and long range. Premiums and acreage, the breeder’s perspective. Breeding special varieties. Future breeding goals. Conclusions.

“The expanding soyfood markets in Japan and the U.S. have generated considerable interest among American soybean producers in recent years. More than 60% of the soybeans used in these markets are grown in the U.S.”

“In survey results, 39 of 43 public breeders and 44 or 67 private breeders responded to questions regarding the breeding of specialty varieties. Twenty-four breeders reported that they are maintaining 36 separate projects for large- and small-seeded varieties (Table 3). Public and private breeders are represented equally in this effort with the majority of these projects underway in the Midwest. Eight public and eight private programs are developing varieties specifically for tofu while 13 public and 7 private programs are developing varieties for natto. One public breeder was interested in soy milk varieties but considered varieties for tofu and soymilk as the same. One private and two public breeders are interested in large-seeded garden types for the fresh market in urban areas with large oriental populations. One public and one private breeder expressed interest in small-seeded varieties for sprouts. Soybean sprouts are primarily a Korean soyfood; and, Koreans buy U.S. soybeans for making sprouts in some years.” Address: Research Geneticist, USDA-ARS, North Carolina State Univ., Raleigh, NC. Phone: 919-737-2734.

1232. Fujii, H.; Shiraishi, A. 1987. [Developments in natto microbiology]. *Nippon Jozo Kyokai Zasshi (J. of the Society of Brewing, Japan)* 82:266-72. [Jap]\*

1233. Fujii, H. 1987. [Progress in natto microbiology]. *Nippon Jozo Kyokai Zasshi (J. of the Brewing Society of Japan)* 82(4):266-72. [Jap]\*

1234. Kiuchi, Kan. 1987. Nattô [Natto]. In: Encyclopedia of Food Materials and Dishes. Tokyo: Gakushu Kenkyusha. See p. 259-62. [Jap]\*

1235. Onozaki, H.; Yamamoto, M.; Isshiki, S.; Esaki, H. 1987. [Levan production by *Bacillus subtilis* isolated from commercially available natto preparations]. *Nihon Eiyo*

*Shokuryo Gakkai-shi (J. of the Japanese Society of Nutrition and Food Science)* 40(5):405-09. [11 ref. Jap; eng]\*

• **Summary:** 33 strains of *B. subtilis* were isolated from commercially available natto preparations. These strains produced significantly different amounts of the viscous material, levan. Levan production reached a maximum after 8 days of cultivation, the optimum temperature ranging from 25-30°C and the pH from 5 to 8, respectively. Sucrose was the most suitable C source and levan production increased in parallel with the initial sucrose concentrate. Address: Dep. of Food & Nutrition, Sugiyama Jogakuen Univ., Chikusa-ku, Nagoya 464, Japan.

1236. Oyeleke, L. 1987. Production of dawadawa in Nigeria. In: Proceedings of a Workshop on Nigerian Soybean Production and Utilization. Held at IAR&T, Ibadan, Nigeria. \*

• **Summary:** The earliest known use of soybean in the Nigerian diet was in the form of dawadawa, a fermented soup condiment traditionally made from the locust bean (*Parkia filicoides*). Some of the factors militating against the continuing use of the locust bean are discussed, including the fact that the locust bean tree grows wild and uncultivated, and it takes several years to mature.

1237. Salt of the Earth. 1987. Catalog [Mail order]. P.O. Box 1614, Rifle, CO 81650. \*

• **Summary:** Talk with Ron Roller. 1991. Nov. 22. Scott Halizon of Salt of the Earth in Rifle, Colorado, sells natto starter cultures.

Talk with Scott Halizon. 1991. Nov. 23. In about 1971 Scott decided to learn as much as he could about salt and to make traditional salt available in America. His company now makes salt in Mexico, on the west/Pacific side of Baja, California. He brings this crude salt to Colorado, dissolves it in water, filters out the dust and grit, boils it, recycles the nigari, and dries it for sale. He started to sell this salt in about 1978-80 via a company he established named The Salt Company. Address: Rifle, Colorado. Phone: 303-625-4444.

1238. Tanahashi, K.; Takano, K.; Matsumoto, S.; Kamoi, K.; Obara, T. 1987. [Trypsin inhibitor activity of soybean products]. *Nogaku Shuho (General Report on Agricultural Science)* 32:206-11. [Jap]\*

1239. Beuchat, Larry R. 1987. Food and beverage mycology. 2nd ed. New York, NY: Van Nostrand Reinhold. xiii + 661 p. Illust. Index. 23 cm. [20+ soy ref]

• **Summary:** Contents: Contributors. Foreword. Preface. Classification of food and beverage fungi, by E.S. Beneke and K.E. Stevenson. Relationships of water activity to fungal growth, by Janet E.L. Corry. Fruits and fruit products, by D.F. Splittstoesser. Vegetables and related products, by R.E. Brackett. Meats, poultry, and seafoods, by James M.

Jay. Dairy products, by Elmer H. Marth. Field and storage fungi, by C.M. Christensen. Bakery products, by J.G. Ponte, Jr. and C.C. Tsen. Traditional fermented food products, by L.R. Beuchat. Alcoholic beverages, by G.G. Stewart. Edible mushrooms, by W.A. Hayes. Poisonous mushrooms, by Donald M. Simons. Fungi as a source of protein, by A.J. Sinskey and C.A. Batt. Fungal enzymes and primary metabolites used in food processing, by R. Bigelis and L.L. Lasure. Mycotoxins, by N.D. Davis and U.L. Diener. Methods for detecting mycotoxins in food and beverages, by L.B. Bullerman. Methods for detecting fungi in foods and beverages, by B. Jarvis and A.P. Williams. Appendix. Regulatory action levels for mold defects in foods.

Chapter 9, "Traditional fermented food products, has a section on koji and a long section on fermented soybean foods that discusses: Shoyu, miso, natto (incl. itohiki-natto, yukiwari-natto, and hama-natto / hamanatto; called tu su by the Chinese and tao-si by the Filipinos), sufu, meitauza, and t mp  [tempeh]

Tables show: (9.1) Some fermented foods of fungal origin. For each food is given: Product name, geography, substrate, microorganisms, nature of product, and product use. Soy-related products include: Chee fan, Chinese yeast, Hamanatto, kecap, kinema, ketjap, meitauza, meju, miso (incl. chiang, jang, doenjang, tauco, tao chieo), natto, soybean milk, soy sauce (incl. chiang-yu, shoyu, toyo, kanjang, kecap, see-ieu), sufu (tahuri, tao-kaoran, tao-ju-yi), tao-si, taotjo, tauco and t mp h. Address: Dep. of Food Science, Agric. Exp. Station, Univ. of Georgia, Experiment, GA 30212.

1240. Campbell-Platt, Geoffrey. 1987. Fermented foods of the world: A dictionary and guide. London and Boston: Butterworths. xxiii + 291 p. 26 cm. [25 soy ref]

• **Summary:** The author classifies fermented foods into 9 groups: Beverages, Cereal products, dairy products, fish products, fruit and vegetable products, legumes, meat products, starch crop products, and miscellaneous products. Fermented legume products are particularly important in the diets of East Asia, Southeast Asia, and the Indian subcontinent. He has sections on many fermented soyfoods: Dawadawa, hama-natto, kenima [sic, kinema], miso, natto, tempe (incl. tempeh, tempe bengook, tempe bongkrek, tempe gembus [okara tempeh], tempe lamtoro, tempe mata kedele), and sufu (incl. teou-fu-ru). He lists major areas consumed, related terms, how consumed, types, how produced, microbiology and biochemistry, and a few key references. His research began in Ghana with dawadawa made from the African locust bean. Address: National College Prof. of Food Technology, Dep. of Food Science & Technology, Univ. of Reading, Reading, Berkshire, UK.

1241. Gubels, Peter A.; Iddi, Alice. 1987. Case study: Women farmers. Cultivation and utilization of soybeans

among West African women through family health animation efforts. World Neighbors, 5116 North Portland Ave., Oklahoma City, OK 73112-2098. 18 p.

• **Summary:** Since 1979 World Neighbors has been working with FHAS (Family Health Advisory Services), a Togolese non-governmental organization, to introduce soybeans to women in Togo, Mali, and Ghana. The program started in about 1983 and by 1986 hundreds of women were growing and using soybeans with excellent results. FHAS is run by two dynamic West African women, whose roots are in the village: Ayele Foly (Togolese) and since 1986, Alice Iddi, a Ghanaian. The programs are aimed at helping women to significantly decrease malnutrition among their children, generate income for family use, and participate more fully in family decision making concerning land allocation. Typically 50-60% of the children in villages studied were malnourished. Protein intake has dropped dramatically in the last 10 years.

The main interest of African governments has been in promoting soybeans not for home consumption but as a commercial cash crop. Other constraints are poor seed viability, need for rhizobial inoculants, and lack of a market. Soybeans are now widely used in place of dawa-dawa seeds, which are increasingly scarce, to make a mashed mustard-like seasoning (soumbala). The women also learn to make soy flour and porridge. Rabbits are the most serious pest.

In the Savana region of northern Togo by 1984 at least 326 women in 38 villages had been trained to grow and use soybeans. The results in each village demonstrated that soybeans produced at least double or even triple the yield of local bean varieties, in half the time. In the Bassar district of Central Togo 139 women in 15 villages were growing and using soybeans by 1986. Mothers of malnourished children were trained to prepare enriched porridge. The use of color-coded plastic armbands has been a key tool in showing mothers the progress made by their malnourished children. In Jan. 1987, in the Sanando district of Mali, Alice Iddi organized a 5-day village based training course on soybean utilization. The research station in Cinzana is now having good results growing local soybean varieties. And in northern Ghana trial plots have been started. Address: Oklahoma City, Oklahoma. Phone: 405-946-3333.

1242. Karki, Tika. 1987. Indigenous fermented foods in Nepal. In: Fujiharu Yanagida, ed. 1987. *Traditional Foods and Their Processing in Asia*. Tokyo: NODAI Research Institute, Tokyo Univ. of Agriculture. vii + 235 p. See p. 122-40. [5 ref]

• **Summary:** Of Nepal's population of 16 million, 90% are involved in agriculture. A conservative estimate calculates the production of kinema to be 300 tonnes/year. Kinema is a traditional non-salted soybean fermented food product widely and popularly consumed by the Kirat ethnic population of the eastern hills of Nepal, Darjeeling, and

Sikkim. This product greatly resembles natto of Japan and thua-nao of Thailand, and is usually produced in the winter season. Kinema is consumed both as a soup, with other green vegetables, and as a curry. A *Bacillus subtilis* strain has been found to be the dominant microflora of kinema fermentation (Karki, 1985). Production figures of kinema are not available, but a conservative estimate would be around 300 tonnes. The obvious reason for the limited kinema production is the virtual ignorance of this product. Even researchers have little knowledge of it. Another plausible explanatory factor is the typical ammonia-like odour which many people living in other parts of the country are not partial to.

Preparation of kinema: Soybeans are washed, soaked overnight, cooked at boiling temperatures till softened and then mashed by light pounding. About 0.5% ash is added and mixed in thoroughly by hand. The mixture is then fermented overnight in a bamboo basket surrounded by banana leaves, at a temperature of around 25°C. After fermentation, the fresh kinema is dried in the sun for about 3 days and then stored for six months. Reducing sugar is drastically reduced in kinema, compared to natto. A higher ash content in kinema may be due to the addition of ash during processing. It is very important to maintain a balance between acid, reducing sugar, the ammonia odour, stickiness, and textural characteristics, in order to improve the kinema processing technology.

Chemical composition of kinema, averages: Moisture (8.9%), protein (46.2%), fat (18.1%), total sugar (21.2%), reducing sugar (2.1%), crude fiber (7.1%), ash (5.2%), acidity (1.52%). Address: Central Food Research Lab., Nepal.

1243. Kawamura, Yojiro; Kare, Morley R. eds. 1987. *Umami—a basic taste: physiology, biochemistry, nutrition, food science*. New York, NY: Marcel Dekker. xiv + 649 p. Proceedings of the First International Symposium on Umami, held Oct. 7-10, 1985, Lihue, Kauai, Hawaii. Illust. Illust. Index. 24 cm. [1400\* ref]

• **Summary:** Contains 28 papers by 48 different authors, quite a few of them from the Ajinomoto Company, Inc. (Kawasaki, Kanagawa prefecture, Japan). The basic message of this book is the same as its title: Umami is a basic taste, just like the traditional four—sweet, sour, salty, and bitter, which were advanced before modern taste physiology had developed. The term “monosodium glutamate (MSG)” appears many times in the index, but the word “Ajinomoto” (“a tradename for a mixture of MSG and ribonucleotides”) does not. At the end of each paper are many references.

The taste of MSG is unique: In Japanese it is called “umami” (p. 83). “Glutamic acid (Glu) elicits a unique taste (*umami*) in human sensations...” (p. 3). “Umami” is also found in basic traditional, natural foods widely used in Japanese cookery: *kombu* / *konbu* (*Laminaria japonica*, a sea

vegetable), *katsuobushi* (dried bonito flakes), and *shiitake* mushrooms (p. 86). However MSG is derived naturally from konbu whereas GMP (guanosine 5'-monophosphate) is derived from shiitake. These substances were previously thought to "enhance taste intensity" (p. 35, 256). The "Chinese restaurant syndrome" is discussed on pages 309-14. Although "soy" is not mentioned in the index, it does appear several times in the book: soy sauce (p. 257), soy (p. 265, 267, 268).

Contents (in 8 parts): I: General concepts (3 papers. "Recent progress in the taste receptor mechanism." "Fundamental properties of umami in human taste sensation." "The umami taste concept: Implications for the dogma of the four basic tastes" (sweet, sour, salty, bitter)). II: Developmental aspects (3). III: Receptor mechanisms (5). IV: Psychometric analysis (7). V: Physiology and behavior (3). VI: Brain mechanisms (3). VII: Nutrition and behavior (3). VIII: Overview. Address: 1. Faculty of Nutrition, Koshien Univ., Takarazuko, Japan; 2. Director, Monell Chemical Senses Center and Dep. of Physiology, Univ. of Pennsylvania, Philadelphia, PA.

1244. Nichterlein, Karin. 1987. Huelsenfruechte [Legumes]. Bonn, Germany: AID (Auswertungs- und Informationsdienst fuer Ernaehrung, Landwirtschaft und Forsten). 20 p. Illust. 21 cm. [10 ref. Ger]

• **Summary:** The section on soybeans (p. 14-16) discusses soya oil, lecithin, soybean meal, soy protein concentrates, soya bread, low-fat soy flour, Sojamar (Soya meat), TVP, soya milk, tofu, soy sauce (shoyu, tamari), miso, tempeh, sufu (fermented tofu), natto, and soy sprouts. Address: Institut fuer Pflanzenbau und Pflanzenzuechtung I, Giessen, Germany.

1245. NODAI Research Institute. 1987. Traditional foods and their processing in Asia. Tokyo: NODAI Research Inst. vii + 235 p. Seminar held Nov. 13-15, 1986 at the Tokyo Univ. of Agriculture, Tokyo, Japan.

• **Summary:** Contents include: Oncom: Fermented peanut pressed cake, by Dedi Fardiaz. Mochi: Rice Cake, by Akiko Kawabata. Miso: Bean paste, by Hisao Yoshii. Chemistry and technology of tofu and its derived products, by Tokuji Watanabe. Indigenous fermented foods in Nepal, by Tika Karki. Improvement of traditional soy sauce fermentation mold, by Sri Hartadi and Siti Kabirun. Address: Tokyo Univ. of Agriculture, 1-1-1 Sakuragaoka, Setagaya-ku, Tokyo 156, Japan.

1246. Onishi, Reiko; Abe, Keiko; Honma, Seiichi; Aida, Ko. 1987. Nattô no nenshitsu-butsu ni kansuru kenkyû [Studies on a viscous substance of natto]. *Nippon Kasei Gakkai-shi (J. of Home Economics of Japan)* 38(10):871-76. (Chem. Abst. 108:73981. 1988). [15 ref. Jap; eng] Address: 1&3. Faculty of Home Economics, Ochanomizu

Univ., Bunkyo-ku, Tokyo 112, Japan.

1247. Rizzi, George P. 1987. The biogenesis of food-related pyrazines. *Food Reviews International* 4(3):375-400. [102\* ref]

• **Summary:** Flavorous pyrazines have been found in many fermented foods; the most extensive studies are those on soybeans, cocoa, and cheeses. At least three studies (which are summarized) have shown that natto contains various pyrazines. Table 2 (p. 379) shows pyrazines in foods produced by specific microorganisms; they are found in natto (produced by *Bacillus natto*), soysauce (*Aspergillus sojae*), miso (*Aspergillus oryzae*), and soybeans (*Aspergillus oryzae*). Address: The Procter & Gamble Company, Cincinnati, Ohio.

1248. Singleton, Paul; Sainsbury, Diana. 1987. Dictionary of microbiology and molecular biology. 2nd ed. Chichester, New York, Brisbane, Toronto & Singapore: John Wiley & Sons, Ltd. xii + 1019 p. Illust. 25 cm. A Wiley-Interscience Publication.

• **Summary:** Contains entries for: fermentation, fermented foods, fermenter (fermentor), miso, natto, nitrogen fixation (dinitrogen fixation), ogi, oncom, shoyu (see Soy sauce), soy paste (see Miso), soy sauce (shoyu), sufu, tempeh, tofu (an intermediate in Sufu production).

1249. Terajima, Ryôan. comp. 1987. Wakan sansai zue 7 [Collection of Japanese and Chinese diagrams and drawings of all things]. Tokyo: Heibonsha. 442 p. 18 cm. Series: Toyo bunko, no. 471. Toyo Pocket Library series. [Jap]\*

• **Summary:** See Terajima 1711 (or 1713). This is a translation into modern Japanese, with a title slightly different from that of the original. There have been at least 3 different editions over the centuries, most recently in 1907, 1929, and 1980 on. The set published by Heibonsha was published in 16 volumes from 1980 (vol. 1) to 1990 (vol. 16). This Vol. 7 was chosen at random as one example. We do not know which volume (or volumes) contains the information on soy. Address: Physician.

1250. Weingartner, Karl E.; Dashiell, K.E.; Nelson, A.I. 1987. Soybean utilization in Africa: making place for a new food. *Food and Nutrition (FAO)* 13(2):21-28.

• **Summary:** Contents: Introduction. Research into utilization. African governmental support. Commercial soy foods. Utilization in village homes. Soybean oil and animal feed.

"For the most part, the lack of attention to possible uses for soybeans has stemmed success of promotional efforts on the production side... Two international institutions are involved with soybean utilization in sub-Saharan Africa: the International Institute of Tropical Agriculture (IITA) at Ibadan, Nigeria, and the International Soybean Program

(INTSOY) of the University of Illinois, Urbana, Illinois, USA. Research has focused particularly on problems at the small-holder and community level... In 1985, IITA started a programme to promote processing and utilization of soybeans. It has collaborated with INTSOY in the development of intermediate and home-level technology in the areas of oil technology, soy milk production and extrusion cooking.” IITA has installed a dry extruder made by Insta-Pro International (Des Moines, Iowa) and is testing it.

The major soybean producers in sub-Saharan Africa are Zimbabwe (80,000 tonnes/year in 1986/87), Nigeria (75,000), Zambia (35,000), and Zaire (30,000). “In Zaire, soybeans are mostly used at the home level. In Zambia and Zimbabwe, soybeans are processed into oil and animal feed. In Nigeria, they are used in home consumption and to a lesser extent as animal feed.”

Some governments are actively supporting soybeans. Burkina Faso encourages soybean growing by buying them directly from farmers. Zimbabwe sets a preplanting price. Nigeria has developed a nationally coordinated approach to soybean research and production involving farm research institutions. The planning section in the Kenya Department of Agriculture has recommended that 128,000 hectares in Kenya are suitable for growing soybean as a second crop after maize.

“There are still very few networks on soybean utilization in sub-saharan Africa. In 1987, the Nigerian Soybean Association was founded. In 1986 the National Oilseed Development Company (Zambia) Ltd. was formed to assist small-scale production of soybean. The Commercial Oil Seed Producers Association is promoting utilization in Zimbabwe. The Catholic community in Zaire has set up a loose network of cottage industries.

In Africa, soymilk has great potential as a consumer product, although there are presently only a few soymilk factories in Africa: Vitalait is made in Burkina Faso and Soyapro in Kinshasa, Zaire. “Possibly the most popular soy food in sub-Saharan Africa is a beverage called Mahewu which is manufactured by Nutresco in Harare, Zimbabwe.” It is made from soy and maize. Popular soy-based infant baby foods are Nutrend (made by Nestlé in Lagos, Nigeria) and Cerevap (made by Victoria Associated Products [VAP] in Kinshasa, Zaire). “There are several soy/maize breakfast cereals available but they are less popular than the soy-based infant food. They include Nutri-Plus Soy made by Nutresco, Nutrima-10 [Nutrimax-10] by Smallette Foods (Ilorin, Nigeria), and Country Morning by Nestlé (Lagos, Nigeria).

“Soy flour, biscuits and cookies are also popular. In Zaire, several cottage industries including the Bisoka Company (Kananga, Kasai Occidental) use different proportions of soy, wheat and sorghum flour to produce sweet cookies which are especially popular with school children. Soy flour also is a popular commercial item

in Zaire. The Centre de Développement Intégral grows soybeans in Bwamanda and processes them in Kinshasa. In 1986 it produced about 450 t of soybeans. Of this, about 50 per cent was made into full-fat soy flour. In Benin, the Centre Horticole et Nutritionnel makes Farine Bébé.”

“The most widely consumed soy-based food at the rural level in West Africa is made using fermented whole soybean and is called ‘dadawa’ (in Hausa [northern Nigeria]), ‘iru’ (in Yoruba [southwest Nigeria]) or “soumbala’ (in Dioula [also spelled Jula, Dyula and Joola, a Mande / Manding language spoken in Burkina Faso, Cote d’Ivoire & Mali]). Dadawa was traditionally made from locust bean seeds, which are becoming scarce and are being replaced by soybeans. Kafanchan, in Kaduna State of Nigeria, is the processing and marketing centre for dadawa. From there, it is transported by traders throughout Nigeria and to Cameroon, Chad, Niger, Benin and Togo. Millions of West Africans use a small amount of dadawa each day to add flavour to their stews (similar in taste to a beef concentrate or seasoning cube). Dadawa may also be prepared at home. People in remote areas of northern Ghana have been observed growing soybeans in their compound gardens specifically for dadawa production.

“Soybeans have been used as an aid to medicine in missionary hospitals since early in the 1960s. In Zaire, the Catholic community encourages production and utilization of soybeans. A doctor with the Presbyterian community near Kananga (Kasai Occidental, Zaire) asks mothers of malnourished children to buy soybean flour as a condition for medical treatment.”

In Ghana, roasted soybeans are used in the home preparation of tuubani; they are ground, mixed with water to form a paste, then steamed inside a folded leaf. In Nigeria, dawadawa and soybean paste are added to *egusi* (vegetable soup), and ground soybeans are added to *ogi*. In Zaire, people make roasted soy flour, then add it to *bouille* or *bidia* (a thick porridge). In Zambia, soy flour is mixed with mealie meal to make *nsima*, or added to cooked green vegetables to make a relish.

“Approximately 40% of the edible oil consumed in Zimbabwe is from locally grown soybeans. The LINT Company of Zambia (LINTCO), a quasi-government group, is helping farmers with production and marketing of soybeans... A new soybean crushing plant in Makurdi, Nigeria, with a capacity of 72,000 tonnes/year is scheduled to open in early 1988.” It should lead to increased demand for Nigerian-grown soybeans. Address: 1-2. IITA (International Inst. of Tropical Agriculture), PMP 5320, Ibadan, Nigeria; 3. Soybean Utilization Program Leader, INTSOY, Univ. of Illinois, Urbana, IL 61801.

1251. Weingartner, Karl E.; Dashiell, K.E.; Singh, S.R. 1987. Soybean utilization in Africa. *Tropical Grain Legume Bulletin* No. 34. p. 2-6. [5 ref]

• **Summary:** The contents of this article are very similar to that of: Weingartner, Karl E.; Dashiell, K.E.; Nelson, A.I. 1987. "Soybean utilization in Africa: making place for a new food." *Food and Nutrition* (FAO) 13(2):21-28. Address: International Inst. of Tropical Agriculture (IITA), PMB 5320, Ibadan, Nigeria.

1252. Yamasaki, Yoshio. 1987. Nattô-kin chû no nigami pepuchido [The bitter peptide in natto]. *Nippon Kasei Gakkai-shi (J. of Home Economics of Japan)* 38(2):93-97. (Chem. Abst. 107:38308). [9 ref. Jap; eng]

• **Summary:** Butanol, the bitter peptide, was extracted from natto and separated into bitter peptide-rich fractions and other fractions. The amino acid composition of the main peptide component was analyzed. Address: Sakuyo Junior College, Tsuyama, Okayama 708, Japan.

1253. Takano Foods Co. 1987? Shôhin annai [Catalog of soyfood products]. Ibaragi-ken, Japan. 6 panels. Undated. 30 cm. [Jap]

• **Summary:** Takano Fuuzu K.K. makes 43 soyfood products, mostly natto, but also some tofu. On the cover, two black lacquered chopsticks hold a single yellow soybean over a red tray on a red table. Address: Ibaraki-ken, Japan. Phone: 02995-8-232.

1254. Takano Foods Co. 1987? Healthy wave [Healthy wave]. Ibaragi-ken, Japan. 16 p. Undated. 30 cm. Catalog. [Jap]

• **Summary:** This catalog introduces Takano Fuuzu K.K. and its soyfood products, mostly Okame natto, but also some tofu. Address: Ibaraki-ken, Japan. Phone: 02995-8-232.

1255. Brunthaler, Norbert. 1988. Re: Soyfoods made and sold by Sojvita. Letter to William Shurtleff at Soyfoods Center, Jan. 4. 1 p. Typed, with signature on letterhead. [Eng]

• **Summary:** "Thank you for your letter of Dec. 10." He gives the year and month that his company started to make and sell the following products: Tofu, Tofu marinated and baked, Tempeh, Sojanaise, Tofuburger, Tempeh vacuum packed and stable, Tofu spread (4 kinds), Sojella (enriched soymilk), Soyoghurt with fruits, Natto.

"These are only our soy-products which we sell by ourselves or through distributors in Austria. (Furthermore we produce rice-wafers, seitan, gomasio {sic, gomashio, sesame salt}, mochi.) We cannot say, which company is the largest in Austria, but we have the most different kinds of soyproducts. Our next competitor is: Sojarei in Baden and a smaller one is Tofurei in Wels. Furthermore there is only one Tempeh-producer in Vienna who sells tempeh and different cookies. These are all soy-producers in Austria. We hope we could help you with this information. With best regards. N.S.: Red miso and barley miso is in development since 1984." Address: Sojvita Produktions GmbH, Hauptplatz 1,

Lichtenwoerth, Austria. Phone: 02622 / 75494.

1256. Shurtleff, William; Aoyagi, Akiko. comps. 1988. Marketing soyfoods—Labels, ads, posters, and other graphics: Soynuts, natto, modern soy protein products, soy flour, soy oil, whole soybean foods, letterheads and business cards. Lafayette, California: Soyfoods Center. 76 leaves. Illust. No index. 28 cm. Series: Marketing soyfoods.

• **Summary:** This book is a collection of black-and-white photocopies of materials. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

1257. Kanai, Noritoshi. 1988. Miyako Oriental Foods, Mutual Trading Co., Rice Koji, Amazake, Natto, and Miso (Interview). *SoyaScan Notes*. March 4 and 10. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Mr. Kanai recalls that the brochure describing how to make miso and amazake using Cold Mountain Koji was printed in 1976, the same year the Miyako factory began. They immediately started to sell the koji, using the brochure. Miyako is owned 60% by Mutual Trading Co. and 40% by Yamajirushi Miso Co., a joint venture.

Mutual Trading Co. started to import Amazake from Japan to American in about 1968. He thinks they were the first company to do so. If that is correct, this would have been the first amazake sold commercially in the USA. The product was imported frozen in non-aseptic polyethylene bags. At the same time they imported frozen natto, and non-frozen miso and Hamanatto. Mutual Trading presently imports amazake in 6.3 oz (180 ml) cans. It is ready to drink. His amazake is made in Japan by Morinaga, the confectionery company, not the milk company. It is a real amazake, not a sake kasu type. Nishimoto also imports amazake in 6.3 oz tins; the brand is Imuraya. North American Food in San Francisco, a sister company (not a subsidiary) of Mutual Trading Co. Tokiwa in Los Angeles, Hosoda Brothers in San Francisco, and Central Boeki in Long Island, New York, probably do not import amazake. He thinks that total imports are about 1,000 cases a year. Mutual Trading imports about 200 cases a year (48 x 6.3 oz cans/case).

Miyako has recently reached its full capacity for making koji. So they are planning to expand by installing an automatic koji making machine. The machine has already been ordered from Nagata (preferred over their competitor Fujiwara) in Japan. The machine should be in Los Angeles in late April or early May, and start operation by June. He is thinking of adding barley miso and a new variety of rice miso. Now they use only half of the building's floor space, so there is plenty of room for expansion. They plan to expand upward one level. Address: Los Angeles, California.

1258. **Product Name:** [Tofu, Tempeh, Natto, Okara Croquettes].

**Foreign Name:** Tofu, Tempeh, Natto, Croquettes d'Okara.

**Manufacturer's Name:** Gaïa Enterprise. Officially registered in Jan. 1992.

**Manufacturer's Address:** Rue Principale, 66130 Corbere, France. Phone: 68.84.86.28.

**Date of Introduction:** 1988. March.

**New Product–Documentation:** Form filled out for Anthony Marrese. 1989. Nov. These three products were introduced in March 1988 by Odile Corbel & Dan Ludington. The following amounts are presently produced: Tofu 3 kg/week (sold fresh), tempeh 3 kg/week (non-pasteurized), natto 2 kg/month, and okara croquettes 2 kg/month. Odile started making her own tofu for 2 people each week, then for friends. A friend (Pauline Schaft) supplied her with tempeh, natto, and koji for amazake. In 1986 she went to the Kushi Institute in the USA. She returned to France at the end of 1987 with Dan and began her own small production daily.

Letter from Daniel S. Ludington. 1992. Feb. 7. He has been making tofu, tempeh, and miso for sale for 3½ years. He learned to make them using books by Shurtleff and Aoyagi. Now he would like to order their books *Miso Production*, and *Tofu & Soy milk Production*.

Letter from Dan. Ludington. 1992. March 3. "Gaïa Enterprise was officially registered with the Chambre de Metiers of the Pyrenees Orientales in Jan. 1992. (She had been unofficially in existence using the same name for nearly four years)." Dan's father was a 20-year career cook in the U.S. submarine service. He died instantly of a heart attack at age 54. Dan is the oldest of 4 boys. He received a degree in chemical engineering from MIT in 1977, then worked for Intel Corp. in their factory making silicon chips for 5 years, then for Toshiba USA for another year. When his father died, he kept a 10-year promise to himself to hitch-hike around America. In or about Loveland, Iowa, his chemical engineer's eyes saw how chlorinated hydrocarbons enter the food chain, and he decided to stop eating meat. About 6 months later he was introduced to macrobiotics. 2½ years later he went to the Kushi Institute in Boston, Massachusetts, to see if he could find a better balance in his diet. There he met Odile Corbel, a French woman with a 12 year-old son named Xavier and 10 years of macrobiotic experience. They were married, and returned to France. 18 months later Dan got a Green Card. While Odile was in the USA, Pauline Schaft had stopped making tempeh, and a weekly, organically grown products market had started in Perpignan. So he and Odile started making tofu, tempeh, and macrobiotic British pasties and selling them at this market. The business has grown until today sales are \$400/week. He and Odile are still married with 2 children of their own. Pauline Schaft now goes by her maiden name of Van Marle; she is now more involved with her yoga practice than with making food. The company now sells 12-15 kg/week of tofu, 3-5 kg/week of tempeh, and 4 kg/week of miso, all direct and without the use of labels, marketing, or distribution.

1259. **Product Name:** Natto Spore Kit (11 gm; extended with organic rice flour), or Commercial Natto Concentrated Spores [2.2 gm vial].

**Manufacturer's Name:** GEM Cultures.

**Manufacturer's Address:** 30301 Sherwood Rd., Fort Bragg, CA 95437. Phone: 707-964-2922.

**Date of Introduction:** 1988. March.

**New Product–Documentation:** Letter from Betty Stechmeyer of GEM Cultures. 1991. Oct. 18. These two basic products were introduced in March 1988.

1260. Hasegawa, Yoshie; Inuta, Toru; Obata, Hitoshi; Tokuyama, Tai. 1988. [Introduction of a high vitamin B-12 productive natto strain through protoplast fusion]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 35(3):154-59. March. [12 ref. Jap]\*

• **Summary:** To breed a high vitamin B-12 producible natto strain, protoplast fusion was done between *Bacillus natto*, Takahashi No.2 (Arg-mutant), and a vitamin B-12 productive strain, *Bacillus megaterium* IAM 1166 (Try-mutant). Lysozyme of 250mcg/ml and 500mcg/ml was adopted for the protoplast preparation of *B. natto* Takahashi No. 2 and *B. megaterium* IAM1166, respectively, with 10% sucrose at 42°C for 30 minutes. Protoplast fusion was carried out with 40% polyethyleneglycol 6000, and the regeneration was performed on Sucrose Glutamate (SG) minimal medium containing 10% sucrose and 3% polyvinylpyrrolidone. Preservation of the stringiness and vitamin B-12 productivity of the protoplast strains were deeply affected by the concentrations of lysozyme and sucrose. Three fusants which were capable of producing stringiness and vitamin B-12 were isolated on SG medium, and the strong stringiness on a steamed soybean by them were also observed in a similar manner as *B. natto*. (From online abstract at <http://www.journalarchive.jst.go.jp/english/>) Address: 1, 3-4. Faculty of Engineering, Kansai University [near Oksaka, Japan].

1261. Ito, Kimio; Yasuhira, Hitomi. 1988. Kônôdo shokuen, gurukoosu sonzaika ni okeru *Bacillus subtilis* no dôtai [Behavior of *Bacillus subtilis* at high concentrations of NaCl and/or dextrose (in miso)]. *Shinshu Miso Kenkyusho Kenkyu Hokoku (Report of the Shinshu-Miso Research Inst.)* No. 29. p. 25-32. [16 ref. Jap; eng]

• **Summary:** Behavior of *Bacillus subtilis* at high NaCl and/or dextrose concentrate was examined, to evaluate the hygiene of miso. Growth, germination and sporulation were completely inhibited by 20% NaCl alone, 10% NaCl/20% dextrose or 15% NaCl/10% dextrose. Critical water activity for growth was 0.88.

1262. **Product Name:** [Freeze-dried Natto].

**Manufacturer's Name:** Koishiya Shokuhin K.K.



**Manufacturer's Address:** Tochigi-ken, Japan. Phone: 0286-82-2220.

**Date of Introduction:** 1988. March.

**New Product–Documentation:** Toyo Shinpo. 1988. March 21. p. 19. “Koishiyu Shokuhin, the ‘One hundred year old beans of rare taste’ company has recently released freeze-dried natto as part of their product line.” Mr. Eiichi Koike is president of the company. The firm started to market the new product on March 1. Aluminum packaged, 30 gm of freeze dried natto sells for ¥280 at retail stores. People can use this as a snack—somewhat like peanuts. They are hoping that this type of natto will get people used to the real natto taste.

1263. Pecjak, Marinka. 1988. Soja v kuhinjski [Soybeans in the kitchen]. Ljubljana, Yugoslavia: Feniks. 138 p. Illust. Plus 16 pages of color plates showing recipes. 21 x 30 cm. [Slv]

• **Summary:** Features 300 recipes that use soybeans and soyfoods. Contents: Introduction: In the beginning there was the soybean, almost anything can be made from soya (a diagram shows many food and non-food products), soya is concentrated, soybeans in cuisine, how to use these recipes. Whole soybeans (p. 17): Recipes for coffee, different kinds of spreads, salads, soups, green soybeans with rice, dips with whole soybeans, soybeans with mushrooms, patties, soybean roast, sausages made of whole soybeans, stuffed duck, stuffed trout.

Soybean flakes and textured proteins (p. 40): Spread, party balls, filled bread, soups, pancakes, Australian pie, Buckwheat with flakes, flakes in mushroomy sauce, baked potatoes, stuffed cabbage leaves, chilled stuffed tomatoes, stuffed roasted peppers, stuffed eggplant.

Soymilk and dairylike products (p. 74): Various spreads, soups and salads with herbs, pancakes, baked potatoes, baked noodles, soy pudding, soymilk ice cream, avocado milk. Soy flour and semolina (p. 111): Soy noodles, pasta, pancakes, fish balls, soy bread.

Soy sprouts (p. 122): Soups, salads, sprouts with potatoes, chicken with sprouts and wine, pork with sprouts. Soy sauce and other forms of fermented soybeans (p. 128): Chart showing fermented soy products (incl. miso, tempeh, sufu, natto), salads, soups, chicken with sprouts and soy sauce, meat with fermented black soybeans, roast cutlets, Hoisin dip.

1264. Sulisty, Joko; Taya, Nakatoshi; Funane, Kazumi; Kiuchi, Kan. 1988. Production of natto starter. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 35(4):278-83. [12 ref. Eng; jap]

• **Summary:** 3 strains of *Bacillus natto* starter were incubated in 3 media, i.e. (1) soybean extract agar, (2) phytone agar, and (3) nutrient agar, to determine effect of media on natto quality. It was concluded that quality of natto produced

from 1. and 2. was better than that of 3. Address: 1. National Biological Inst. of Indonesian Inst. of Science, P.O. Box 110, Bogor, Indonesia.

1265. Ontario Soya-bean Growers' Marketing Board. 1988. Report on export market development mission of the Ontario soybean industry, March 19th–April 3rd, 1988. Chatham, Ontario, Canada. 23 p. May. 28 cm. Spiral bound. [Eng]  
• **Summary:** This report was prepared by Owen Dobbyn, John Cunningham, Maurice Waddick, and Fred Brandenburg of OSGMB. Contents: Japan. The Japanese soybean market. Visits: Japan Miso Co-operative Industrial Assoc. (M. Iida, chairman), Japan Packaged Tofu Assoc. (H. Kijima, Exec. Secy.), Federation of Japan Natto Manufacturers Cooperative Society (Mr. Ohse), Takano Foods Co. Ltd. (E. Takano, president, uses 7,000 to 8,000 tonnes of soybeans annually to make natto), Home Foods Co. Ltd (Home Shokuhin, Y. Murai, managing director, has 160 employees and 3 tofu factories that use 300 tonnes of soybeans/month; owned by Wako Shokuryo, the #1 wholesaler of soybeans in Japan), Japan Oilseed Processors Assoc. (JOPA; H. Higashimori, managing director). Japan Oil and Fat Importers & Exporters Assoc. (JOFIEA; I. Shimizu, exec. director), Canadian Embassy, Tokyo.

Hong Kong. Soybean imports. Visits: The Hong Kong Soya-Bean Products Co. Ltd. (makers of Vitasoy soymilk), Amoy Industries (International) Ltd.

Malaysia. Soybean imports 1984, 1985, 1986. Visits: Ace Canning (owned by Lam Soon). Yeo Hiap Seng (Malaysia) Berhad (soymilk), Cheong Chuan (Hup Kee) Sdn. Bhd. (traditional fermented soysauce), Sin Yong Huat Enterprises Sdn. Bhd. (soybean importers), Syarikat Perniagaan Cheon Fatt (tofu manufacturer).

Singapore. Soybean imports (1983-1986). Visits: Sin Seng Lee Trading Co. (Pte.) Ltd. (claims to import 60% of soybeans to Singapore). Conclusions for each country. Recommendations for future action. Future export development missions. Accomplishments. Competition.

In Japan, 842,000 tonnes soybeans are used to make foods, as follows (in tonnes, p. 1): Tofu 456,000, miso 180,000, natto 90,000, dried-frozen tofu 30,000, boiled soybeans 23,000, soybean powder [probably kinako] 10,000, soymilk, 7,000, soysauce 5,000, other 41,000. The suppliers of these edible soybeans are (in tonnes): USA 400,000, China 280,000, Japanese domestic 280,000, Canada 24,000. Total Japanese soybean imports: 5,000,000 tonnes. Of this 4,036,000 tonnes (81%) are used for crushing, 842,000 tonnes for food, and 70,000 tonnes for feed (not crushed). The Japanese market for soybeans is very large for both crushing and food use, but is not growing. The beans for crushing come mostly from the USA and South America.

Preferred characteristics of soybeans for each type of soyfood are given. For example, for miso: Low oil, high protein, high sugar, white hilum. For tofu: High sugars

(glucose, sucrose), moisture content 10-12.5%, new crop preferred to old, protein 40%, oil 19-20%, hilum color is not very important but white is preferred, varietal consistency; preferred varieties are Beeson, Amsoy, Corsoy. Natto: Most important is small size, 5.5 mm or less, clean beans free of foreign material, high sugar content (saccharose, stachyose, which bacillus needs to work), less oil, must absorb water well. Soymilk: Good flavor, low moisture (10%), low percentage of splits (too high can cause rancidity), low oil, high protein.

In Japan, vegetable oil consumption has increased 2.5 times in the past 20 years to 45.17 gm/capita/day in 1986. Soy oil and canola oil together account for 85% of production. Canola is replacing soybean oil. If the oil market is strong, the 30 Japanese crushers crush more canola, but if protein is strong they crush more soybeans. U.S. soybeans have too much foreign material; new contracts have a penalty for > 2% FM.

In Hong Kong, 6,000,000 cases of Vitasoy brand soymilk are produced annually. The company uses 2,500 tonnes/year of soybeans, 80% of which are grown in Canada. It uses 100 to 200 tonnes of organic soybeans for Vitasoy exported to U.S. health food stores. Using 15 Tetra Pak machines, production takes place 24 hours/day (3 shifts), 6 days a week. Contacts: Patrick Cheung (marketing manager), and Raymond Yuen (commercial manager).

Amoy Industries, the largest maker of soy sauce in this part of the world, produces 6,000 tonnes/year. The company was established 80 years ago in Amoy, eastern China, moved to Hong Kong in 1949; 50% was purchased by Pillsbury in 1983. Uses 2 containers of soybeans/week, 100% from Ontario for the past 5 years.

Malaysia soybean imports rose from 174,400 tonnes in 1984 to 255,200 tonnes in 1986. The main suppliers in 1986 were China (56.2% of total), Vietnam (15.8%), and Argentina (14.3%). Ace Canning uses ton tonnes/month of soybeans (presently all from China) to make soymilk. They have 7 Tetra Pak machines. Yeo Hiap Seng (Malaysia) is the largest soymilk producer in Malaysia, making 25,000 liters/year using 9 Tetra Pak machines. They use 1,250 tonnes of soybeans (80 containers) per year, all Canadian.

In Singapore, soybean imports rose from 28,287 tonnes in 1983 to 41,571 tonnes in 1986. In 1986, some 66% came from Canada, 16.6% from China, and the rest from others.

The major competition for food quality soybeans in these four countries at present comes from China. The Chinese have improved their soybean quality and appear to be actively seeking to increase their market share. In the long run, however, China may choose to reduce its soybean exports in order to increase meat consumption in China. This could lead to new market opportunities for Canada in these four countries. Address: P.O. Box 1199, Chatham, ONT N7M 5L8, Canada. Phone: 519-352-7730.

1266. Shimoda, Keiki. 1988. Naijaria de no nattô shishokukai—Osegere-mura, Zonkuwa-mura no rei [Natto tasting meeting in Nigeria. Examples of Osegere village and Zonkuwa village]. *Daizu Geppo (Soybean Monthly News)*. April/May. p. 32-35. [Jap]

• **Summary:** The first natto taste test in Nigeria was in Lagos. 7 women, ages 30-40, at the Department of Agriculture tried plain, unheated natto. They disliked the sticky/slimy texture, saying that it reminded them of rotten food. But the strong smell of natto was not foreign to them, since they knew dawa-dawa.

The next taste test was in the village of Zonkwa, located 50 km southeast of Kaduna. It had 200 inhabitants of which 10 tasted natto, but the village head tasted first and his response may have influenced that of the other villagers. These people know and consume dawa dawa soup, so the natto was used in a similar soup in place of dawa dawa. The result looked like a thick porridge. In this form, the natto was liked very much. A table compares natto and dawa dawa for appearance, smell, texture, and taste—on 5 levels of like and dislike. In each characteristic dawa dawa scored only slightly higher than natto. Natto received the highest score for its taste (very tasty: 8 vs. 9 for dawa dawa) and the lowest for its mouthfeel (4 vs. 9). All tasters said that natto soup was more “sticky” or mucilaginous (*nebatte-iru*) than dawa dawa soup, and that it reminds them of okra soup with corn.

Then at Zonkwa natto was served Japanese-style on white rice (probably seasoned with shoyu and thinly sliced leeks (*negi*)). The “brave young people who ate it said it as very tasty.”

The last taste test was in the village of Osegere, located about 20 km east of Ibadan. A tempeh experiment had been conducted there by the Denmark Ministry of Development starting in 1981. This time the local people (who did not speak much English) were asked to make natto soup using freeze-dried natto, plus the usual palm oil, pepe, etc. About 10-12 people tasted it and 90% said they liked it very much; 40% said they found it “sticky.” Address: Tsukuba Univ., Shushi Katei Kankyo Kagaku Kenkyu-ka.

1267. Maeda, Toshiie. 1988. Mura okoshi—Tenpe sonjuku [Revitalizing a village—the tempeh village school. I.]. *Toyo Shinpo (Soyfoods News)*. June 1. [Jap; eng+]

• **Summary:** The author, a representative of the school, wrote a book titled Homeland of Miso (*Miso no Furusato*). He discussed the fact that the use of miso mainly in miso soup presents a big problem. The first solution to the problem is to use miso in thick ketchup-like sauces. The second is to return to the non-salted fermented foods such as Japanese natto, Nepalese kinema, Indonesian tempeh, and Chinese fermented black soybeans (shi), which are the ancestors of miso. He emphasized tempeh, which he feels is a wonderful food that can be used in various ways, and is nutritious and healthy. He explained that tempeh is becoming popular in the

USA and Europe, and concluded that tempeh alone can be used to start a food industry.

“Because of this book, I received a visit from 2 people from the “Vitalizing Village Committee” of Kasuga-cho, Hyogo-gun, Hyogo-ken. They asked me to give a lecture on tempeh, for they wanted to consider whether tempeh could be used to help vitalize the village. I accepted the offer, but realized I needed more information on the subject. So I contacted Murata sensei, professor emeritus at Osaka Shiritsu Daigaku, who played a key role in organizing the first international Asian Symposium on Non-Salted Soybean Fermentation in Japan. She and others at the university sent me an encouraging letter, four articles on tempeh, and information on tempeh cookery from the university.

“In late August 1987 I used these material to give a 40 minute lecture on tempeh followed by 20 minutes of questions. It was decided to have a follow-up meeting for tempeh tasting. Through Dr. Murata’s introduction I received 2 kg of free tempeh from a maker in Aichi-ken. The sampling was a big success and was written up in the newspaper in a big way. The local Hyogo prefecture high school food processing department started to experiment with tempeh, and a women’s group, the Kasuga-cho Commerce and Industry Group, began to experiment with tempeh cookery. At the end of Sept. 1987 one of the teachers at the high school succeeded in making tempeh, which made the news. Then they started to make second generation tempeh products, such as confections and breads. At their local school festival in October 1987 he presented the products and gained a good reputation.”

1268. Maeda, Toshiie. 1988. Mura okoshi–Tenpe sonjuku: Tenpe zukuri ga hajimaru [Revitalizing a village—the tempeh village school: Tempeh production gets started. II.]. *Toyo Shinpo (Soyfoods News)*. June 11. [Jap; eng+]

• **Summary:** In Nov. 1987 there was serious discussion of having an international tempeh symposium in the town of Kasuga-cho. This was the idea of Prof. Dr. Tadao Watanabe of Kyushu Univ. Though the idea eventually had to be dropped for lack of funding, the Fifth Tempeh Meeting was held in the village of Kasuga-cho on 19 Dec. 1987. Many prominent tempeh experts attended: Dr. T. Watanabe, Dr. Murata, Mr. Kanasugi, and Mr. Takato. The latter two are also involved with natto. After this meeting, some people wanted to start making tempeh in the village. Taking the initiative were Mr. Kenji Takami (a potter), Mr. Kazumasa Takami (a wood sculptor), and later another Mr. Takami (a horticulturist). They wanted to include tempeh in their lunch program. They started to build a tempeh factory on part of T. Takami’s pre-school, Meitoku Hoiku-en. Dr. Nishira Hiroshi of Kobe University, Dept. of Agric. Chemistry, advised on how to make tempeh starter. Experiments were conducted at Kyoto Tanki Daigaku (Junior College).

In mid-January 1988 the group started to call itself

Tenpe Sonjuku: Kenko Shokuhin Tenpe Kenkyu Sakuru (Tempeh Village School: Health Food Tempeh Study Circle). They bought the best equipment for making tempeh starter. Because of limited capital, they built the plant simply and improvised. For dehulling, they used a tofu shop mill. For separating the hulls by aspiration, a *tomi* developed during the Edo period. For the incubation room, an inexpensive rice sprouting room. For dewatering the beans, a used washing machine centrifuge. For mixing in the tempeh starter, a tofu burger (ganmo) mixer. For incubation trays, used rice sprouting boxes. Address: Kobe Women’s Junior College, food processing.

1269. Shurtleff, William; Aoyagi, Akiko. 1988. *Das Tofu-Buch: Herstellung, Verwendung, Ernahrungswert, Rezepte* [The book of tofu: Preparation, uses, nutritional value, recipes]. Munich, West Germany: Goldmann Verlag. 384 p. Illust. by Akiko Aoyagi Shurtleff. Index. 18 cm. [Ger]  
• **Summary:** A pocket book edition of the original 1980 German edition of *The Book of Tofu*. Contains 300 recipes. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

1270. Udesky, James. 1988. *The book of soba*. Tokyo and New York: Kodansha International. 166 p. Foreword by William Shurtleff. Illust. Index. 27 cm. [50\* ref]

• **Summary:** Contents. Foreword. Introduction. I. Making soba. Homemade soba noodles. Broth. Noodle dishes. Country cooking. Groat cooking. Variations and desserts. Ingredients. II. About soba. Nutrition. Buckwheat: From seed to table. History. III. Appendices. The soba dining experience. Selected soba restaurants in Japan. Oriental, natural, and specialty food stores in the United States and Canada. Bibliography.

Soy-related recipes include: Cold soba noodles with natto and sesame (with “2/3 oz natto,” p. 59). “Fox Soba” (*Kitsune soba*, with “4 pieces thin deep-fried tofu {*abura-age* or *usu-age*}, p. 63). Soba noodles in miso stew (*Kenchin soba*, Ibaragi prefecture, with “4-5 tablespoons miso,” p. 70). Soy-Soba noodles (with “4 oz soybeans” [whole dry soybeans], p. 71). Broiled soba dumpling with miso sauce (with “3-4 tablespoons sweet white miso,” p. 81-82). Soba pasty (with “1½ oz natto, p. 85). Soy sauce is used in many recipes.

The excellent “Ingredients” section (p. 91-98), gives definitions of several soyfoods, including miso, natto, okara, soy sauce, tofu, and tofu–thin deep-fried (*abura-age*, *usu-age*).

The definition of “natto” is especially good: “Natto: This rich soybean product with a cheeselike flavor is still underestimated, unappreciated, and misunderstood, mainly because the sticky ‘threads’ resulting from its special fermentation process are strong and stubborn, making it pretty tricky for beginners to eat. Natto can be made easily at

home with soy beans, 'natto spore' (now available at major health-food dealers on both coasts), a pot, and a box... If allowed to sit too long on store shelves, the beans become overripe. Although you cannot check the quality until you open up the package at home, the best natto should have a light, tannish color and still be moist and a little puffy. Too dark a color indicates overripening and a correspondingly bitter taste. To remedy this situation somewhat, stir the beans together with chopsticks or a spoon and combine with chopped onions, wasabi horseradish, and soy sauce. Since this food is the result of bacterial action, no preservative can be used. Thus, natto should be eaten as soon as possible."

Mr. Udesky had a chance to prepare homemade soy sauce while living with Mr. Noboru Muramoto (author of *Healing Ourselves*) from 1971 to 1975. In the Appendix titled "Oriental, natural, and specialty food stores" is an entry (p. 153, col. 3.8) for: "Foods for Life, 504 E. Broadway, Glendale, California, 91025." Note: This pioneering natural and organic food store is still in business in 1988.

For a complementary review, see Jean Pearce. 1991. Nov. 10. *Japan Times*.

Letter from James Udesky. 1997. April 21. The hardcover edition of *The Book of Soba* has now sold 12,000 copies in Japan and abroad, and 3,000 copies of a new soft-cover pocketbook edition (246 p.; 18.2 cm) were published by Kodansha International in Dec. 1995. An article on soba titled "The Art of Noodles," by Udesky appeared in *Japan Quarterly* (April-June 1997, p. 32-42; it contains a large color photo of him rolling out soba dough). Udesky is living in Tokyo, has lived in Japan (except for a 3-month break in 1988) since 1988, married a Japanese woman in 1990, for the last 2 years has worked for a medical equipment importer and taught English part-time at Dentsu Inc. to survive financially, has established a company named Udesky Communications, and continues his practice of making traditional Japanese soba. He has plans for a new book titled "Basic Techniques of Udon Making." Address: Heim R1 #103, Meguro Honcho 6-18-3, Meguro-ku, Tokyo 152, Japan. Or: The Soba Center, P.O. Box 72, Winnetka, Illinois 60093-0072.

1271. *Toyo Shinpo (Soyfoods News)*. 1988. [A study of the amount of money spent on tofu, aburaage, and natto]. July 21. p. 3. [Jap; eng+]

• **Summary:** From Jan. to April 1988, a total of 25.99 cakes/household were sold, which is 98.8% of last year's figure over the same amount of time. During the same period, however, natto consumption rose, 8% in January (over last year at the same time), and 15.8% in April. Aburaage consumption was slightly down, only 95.1% of last year's total in January, and 94.3% in April.

1272. *Toyo Shinpo (Soyfoods News)*. 1988. Heri tsuzukeru nattô seizô shisetsu sû: Tsuini 900 no ôdaiware [The number

of natto manufacturers in Japan continues to decrease: It finally dropped below 900]. July 21. p. 35. [Jap; eng+]

• **Summary:** There are now less than 900 natto manufacturers in Japan, the lowest it has ever been. In December of 1987, there were 898 natto manufacturers in the country. The number has been steadily dropping by about 2% per year. The problem is that natto manufacturers cannot find anyone interested in taking over the business.

1273. *Watashi no Kenko (My Health)*. 1988. Atarashii nattô tenpe wa kôshite taberu. Indonesia no kusakunai nattô [Here's how you eat the new natto, tempeh. Indonesia's natto that doesn't smell]. July. p. 147-62. [Jap]

• **Summary:** A popular introduction to tempeh containing nutritional information and recipes.

1274. Obafemi Awolowo University, Institute of Agricultural Research and Training. 1988. Soyabean recipes: Integrated farming systems programme. Ibadan, Nigeria: Obafemi Awolowo University. ii + 30 leaves. Sept. 25 cm.

• **Summary:** Contents: Processing of soyabean for recipes utilization. Pre-preparation of soyabean (wet base for soyabean paste, or soya milk and residue [okara], or dry base for full-fat flour). Soya milk (homemade). Soyabean vegetable soup (with whole ground soybeans). Soya ewedu soup (with soyabean flour or okara). Soya gbegiri soup. Soya iru [dawa-dawa]. Soya ogi. Soya eko. Soya akara. Soya moimoin. Soya pudding (with okara or soya flour). Soya ikokore (with soyabean paste). Soya amala (with soya flour). Pounded yam with soyabean paste. Soyabean meat bytes (with soyabean flour). Soya burgers (with soyabean paste). Soya meat (with soyabean paste). Soya snack (with whole dry soybeans). Plantain soya pancake (with soya flour). Soya banana fritters (with soyabean flour). Soyabean candies (with dehulled whole soybeans). Soyabean flour Queen cakes. High protein soyabean flour biscuits. Soyabean bread. Soya pancake. Soya puff-puff. Soya ojojo. Soya aadun. Guidelines for growing soyabean. Address: Inst. of Agricultural Research and Training, Obafemi Awolowo Univ., P.M.B. 5029, Moor-Plantation, Ibadan, Nigeria.

1275. *Seed Industry*. 1988. Sigco Sun to produce soybean. Nov. p. 22.

• **Summary:** A new (and as yet unnamed) small-seed soybean variety, which is about two-thirds the size of Chico and matures about two weeks later, will be used for the manufacture of natto in Japan. Natto, a fermented food, is often served with rice or sushi.

The new variety was developed by the University of Missouri. "Sigco Sun Products, Breckenridge, Minnesota, has been awarded the exclusive right to produce and market the new" variety.

1276. Shapiro, R. 1988. Re: Interested in making some natto.

Letter to William Shurtleff at Soyfoods Center, Dec. 19. 1 p. Handwritten, with signature.

• **Summary:** “I’m interested in making some natto. Please send info. on the starter for natto, the tools or machinery for making natto, and any other available catalogs or technical manuals I might purchase from you. To your knowledge, are there any producers of natto in the U.S.? Sincerely,...” Address: Rt. 5, Box 62, Morgantown, West Virginia. Phone: (304) 291-0414.

1277. Brown, Judy. 1988. The joy of soy: Nutrition for the ‘80s. *Body, Mind & Spirit*. Nov/Dec. p. 30-32.

• **Summary:** Contents (Soyfoods, nutrition, and a healthy diet). Tofu. Tempeh. Miso. Natto. Okara. Soy cheese & soy yogurt. Soy flour & grits. Soymilk. Soy sauce. Resources: Eden Foods, Fantastic Foods, Inc., Lumen Foods Corp., San-J International. Vitasoy (U.S.A.) Inc., Westbrae Natural Foods (Downey, California). Address: President, In Good Taste, 5923 John Adams Dr., Camp Springs, Maryland 20748.

1278. Tamang, Jyoti P.; Sarkar, Prabar K.; Hesseltine, C.W. 1988. Traditional fermented foods and beverages of Darjeeling and Sikkim—A review. *J. of the Science of Food and Agriculture (London)* 44(4):375-85. Dec. [9 ref]

• **Summary:** About 70% of the inhabitants of the Darjeeling district of the state of West Bengal and about 90% in the state of Sikkim (a total of 1.15 million people) traditionally consume large quantities of fermented foods and beverages... The common fermented foods and beverages of the region include kinema, gundruk, sinki, mesu, churpi, shel roti and a variety of jnards.

Includes a discussion of kinema. Although traditionally used by the Nepalese, kinema is now popular among the Lepchas and Sikkimese who call it respectively ‘satyangser’ and ‘bhari.’

Note: This is the earliest document seen (Jan. 2012) that mentions “bhari,” the Sikkimese [Bhutia] name for Nepalese kinema, or “satyangser,” the Lepcha name for Nepalese kinema, which is a close relative of Japanese natto.

Soya beans are washed, soaked in water overnight, cooked by boiling and cooled to room temperature. They are then crushed lightly with a wooden ladle to split the kernels. A small amount of firewood ash is added and blended with the whole soya bean grits which are traditionally wrapped with banana (*Musa paradisiaca* L) or (*Leucoscepterum canum* Smith) leaves; polyethylene bags are sometimes used also. The wrapped mass is covered with sackcloth and kept in a warm place, usually above an earthen oven in the kitchen for 1-2 days during summer or 2-3 days in winter. The formation of mucilage and an unpleasant ammoniacal aroma indicates the desired state of fermentation. Kalimpong kinema has a darker brown color but is less mucilaginous than the kinema from elsewhere. The product is similar to Indonesian tempeh

[sic] and Japanese natto. Kinema is used to give a pleasant, nut-like flavor to curry. It is also dried, fried in edible oil and mixed with salt, onion and chilies to produce pickle.

Figure 1 shows a flow sheet of kinema production: Soya beans (1 kg), washed. Soaked in water (3 liters for 8-10 hours). Excess water drained off. Water added. Cooked (1-1.5 hours in open cooker or 10-12 minutes in pressure cooker). Excess water drained off. Cooled. Crushed to grits. Firewood ash (ca. 1 g). Mixed. Wrapped. Fermented (25-35°C, 1-3 days). Kinema (ca. 2-5 kg).

Fresh kinema keeps for a maximum of one week. The shelf life is often lengthened to one month by drying in the sun or by keeping on earthen ovens in kitchens. Address: 1-2. Dep. of Botany, Univ. of North Bengal, NBU 734430, District of Darjeeling, West Bengal, India; 3. NRRC, ARS, USDA, Peoria, Illinois 61604.

1279. Beddows, C.G. 1988. The old fashioned way with soya. *Food Science & Technology Today* 2(1):12-15. [6 ref]\*

• **Summary:** The following soybean products are described briefly: soymilk, bean curd, tofu, tempeh, natto, sufu, miso, shoyu, and yuba. Protein yields are given for a range of plant crops versus milk and beef, e.g. soybeans 3500 kg/ha/annum versus 75 kg/ha/annum for beef. Recipes are included for miso cream cheese dip and deep fried tofu and miso soup. The marked rise in consumption of soybean products in the USA in recent years is noted. Address: Dep. of Applied Sciences, Leeds Polytechnic, Leeds LS1 3HE, England.

1280. Onishi, R.; Abe, K.; Honma, S.; Aida, K. 1988. [A protease in natto inoculated with *Bacillus natto* IAM 1114]. *Nippon Kasei Gakkai-shi (J. of Home Economics of Japan)* 39:13-19. (Chem. Abst. 108:220540. 1988). \*

1281. Waters-Bayer, Ann. 1988. Soybean daddawa: An innovation by Nigerian women. *ILEIA Newsletter (Information Centre for Low External Input Agriculture, Leusden, Netherlands)* 4(3):8-9. \*

• **Summary:** The innovation is to use soybeans, which are increasingly abundant in Nigeria, in place of the traditional African locust beans, which are increasingly scarce.

Compared to African locust beans, soybeans are easier to prepare, and being smaller, take only about a quarter as long to cook. Also, soy daddawa has no disadvantage with consumers compared to the traditional locust bean daddawa. A significant advantage of soybeans is that it is an annual crop, so its production can be readily increased to respond to increased demand. By contrast, African locust bean trees begin fruiting after 8 years and take 8 more years to reach peak production.

1283. Wood, Rebecca T. 1988. The whole foods encyclopedia: A shopper’s guide. New York, NY: Prentice Hall Press (Simon & Schuster). xv + 218 p. Foreword by

Michio Kushi. Illust. 28 cm. [200\* ref]

• **Summary:** This book is mistitled. It should be titled “Rebecca Wood’s Macrobiotic Views on Natural Foods.” The parts on quinoa, teff, amaranth, and many “macrobiotic foods” provide good information. There is extensive information on soyfoods, all from a macrobiotic viewpoint, but with many errors or undocumented controversial assertions never seen before in the literature, such as the following: “Cold Tofu. Foods that are cooling, like tofu, tend to reduce the fire in the lower organs. This explains why tofu was eaten by Buddhist monks to abate their sexual desires. This is not a prescription against tofu. Well-cooked tofu is less cooling. For optimum health, we need a balance of warming as well as cooling foods. However, if you are feeling cold, or if it is a cold day, or if you have strenuous activities planned, then you may opt for salmon over tofu.”

Foods discussed are: Cheese (imitation soy), ice cream and frozen desserts (soy or tofu ice cream), miso, natto, nigari, soybeans (black, yellow, and “just harvested green soy”), soy flour, soy protein isolate, soy milk, soy nut (“Those oversalted, beggarly little crunches found in everything from trail mix to salads are soynuts,...”), soy oil, soy sauce (“Also known as *Shoyu* and *Tamari*), and soy yogurt, tempeh, tofu, and TVP (texturized vegetable protein {textured soy flour}).

Note: This is the earliest English-language document seen (Feb. 2005) that contains the term “cooling food.” Address: P.O. Box 30, Crestone, Colorado 81131. Phone: 303 (or 719) -256-4939.

1284. Hughes, L. 1988? Soybean food products for West Africa. Ibadan, Nigeria: International Institute of Tropical Agriculture. v + 10 p. Undated. \*

• **Summary:** The preparation of the following soyfoods, using techniques suited for rural and urban West African households, is described: soy flour, soybean paste, soymilk, soybean meat, scrambled soybean meat, soy ogi, soybean

snacks, soybean candies, soy moin moin, soy gbegiri soup, soybean vegetable soup, basic cake mix, soybean bread, soybean biscuits, and fermented soybean iru (dawadawa).

1285. Theses on soybeans and soyfoods: Dissertation Abstracts (Database search report). 1989. 234 p. Jan. 20. 28 cm. Unpublished manuscript. [1106 ref]

• **Summary:** The Dissertation Abstracts database contains virtually every American PhD dissertation accepted at an accredited institution since 1861. A search yielded 1,106 theses on soybeans and soyfoods not including records with the terms pathogen\*, Disease\*, weeds, or insect\* in the title or abstract. \* = truncated term.

It contained the following number of theses on soyfoods: Soymilk 9-14, tofu 6, tempeh 6, miso 4, soy sauce 3, and natto 2.

The most valuable records for us are in the subject categories Food Science & Technology; Health Sciences, Nutrition; and Economics, Agricultural. Other subject categories include: Agriculture (Agronomy, Animal Culture & Nutrition, General, Plant Culture, Plant Physiology); Biochemistry; Botany; Chemistry (Agricultural and Biological, Analytical); Engineering, Chemical; Entomology.

A count of the records in which we were interested by state where the thesis was written shows the following: Illinois 128, Iowa 68, Indiana 37, New York 30, Missouri 28, Michigan 26, Minnesota 25, and Ohio 17.

1286. **Product Name:** [Natto, and Fried Tempeh].

**Foreign Name:** Natto, Tempeh Frit.

**Manufacturer’s Name:** Gaec de La Lix: United Macrobiotic Company.

**Manufacturer’s Address:** 32260 Tachaires–Seissan, France. Phone: 62.65.35.04.

**Date of Introduction:** 1989. January.

**New Product–Documentation:** Form filled out for Anthony Marrese. 1989. Sept. The natto was introduced in Jan. 1989, and 6 kg/week are produced at present. The fried tempeh was launched in June 1989, and 7 kg/week are now produced. Anthony visited the community in mid-Oct. 1989 and noted: “They are a small group similar to Terre Nouvelle, but doing more with soya. Very nice kitchen production (see color slide), which is growing. They sell through markets and through 10 stores, which helps them to educate people. They are all Germans who came to France about 5 years ago mainly because land prices were lower in France.

Label for Fried Tempeh. 1989. 4 by 3 inches. Black photocopy on pink. “Aliment fermenté de soya.” Nature et Progres logo. 200 gm. On the back is information about tempeh.

1287. Chowning, Larry S. 1989. Soybean marketing efforts in Japan earn state honor for local farming operation. *Southside Sentinel* (Urbanna, Virginia). Feb. 2.



• **Summary:** Recently, Montague Farms (owned by Bill Taliaferro of Center Cross in Essex County) introduced VANATTO (which stands for Virginia Natto), a brand of Virginia-grown soybeans for the specific purpose of making natto. Because of the firm's efforts to establish a new international market for Virginia soybeans, Montague Farms was recently honored and awarded a plaque by the Virginia Agribusiness Council. For nearly 5 years, the Taliaferros worked to develop the market in Japan, knocking on doors. "Since establishing the market in Japan, the Taliaferros have over 40 growers in Maryland and Virginia growing the small variety of soybean used to make natto. 'It's really a statewide project,' said Taliaferro. 'We weren't able to grow enough ourselves so we went to other growers across the state.'"

1288. Kendall, Charles. 1989. The natto market in the USA is growing fast (Interview). *SoyaScan Notes*. Feb. 6. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Charles makes natto and sells about 350 to 400 cases per week—specially to Japanese housewives during the cold months. Each case contains 25 x 7 oz. packages of natto. He sells it only by the case, so the minimum order (which keeps shipping costs down) is 25 packages.

Mountain Ark (in Arkansas) used to have a natto maker who made the natto they sold. Address: Owner, Kendall Food Co., Worthington, Massachusetts 01098-9550.

1289. Inoue, Kojiro; Sugarman, Carole. 1989. I made at least 1,000 pieces of sushi a day. Now I have sushi elbow. *Washington Post*. Feb. 26. p. I22.

• **Summary:** The moving and humorous story of Mr. Inoue, age 45, (as skillfully told by Carole Sugarman), who survived the ten-year process of becoming a sushi chef in Japan, then came to America determined to introduce Americans to sushi and raw fish.

After working in sushi restaurants in Japan for 8 years (and getting married) he heard that Japanese restaurants were getting popular in the United States. In 1971 he came to the USA to run a small (5-stool) sushi bar at Sakura Palace in Silver Spring, Maryland. Sushi wasn't yet popular in America and the customers were surprised that anyone would eat raw fish, squid, octopus, eel, etc. They were also scared to try it themselves. Yet ten months later Mr. Inoue asked his wife and young child to join him. He had a hard time finding good quality, fresh fish. Americans told him, "A fish is a fish." Sometimes he brought frozen fish from Japan or California. After 5 years the owner of his restaurant retired and he now wanted to start and own a restaurant for himself. He started as a sandwich shop, then remodeled. It was hard. He had to explain what sushi was and how to eat to potential customers. Many customers asked for a knife and fork; some still do. He explained about wasabi and soy sauce.

In 1977, the McGovern Report was released. It said that 500,000 Americans died of heart attacks and that Japanese

food was low in cholesterol. Because of that, all Japanese restaurants became popular.

Today sushi has become part of American food culture. His customers are now 80% Americans and 20% Japanese. Fresh fish is easy to buy. Mr. Inoue, who was now making 1,000 pieces of sushi day, developed sushi elbow—just like tennis elbow. He had a cast on his elbow for one year.

"Tokyo people love *natto* (fermented soybeans) or miso soup. I eat bread. American bread. Sometimes cereal." Today Americanized sushi is all over Japan. He is still married, but his wife lives in Japan with his three kids. His kids eat American hamburgers, Kentucky Fried Chicken and pizzas in Japan. He operates a sushi restaurant in Washington, DC.

1290. Ogundipe, H.O.; Osho, Sidi M. 1989. Soybean in Nigerian diets—Past, present and future. Paper presented at the Soybean Production and Utilization Workshop. 3 p. Held 13-15 Feb. 1989 at Lagos, Nigeria. [3 ref]

• **Summary:** "Soybean is reported to have been introduced into Nigeria in about 1908. It was mainly restricted to that part of Nigeria now referred to as Benue State and the Zonkwa-Abuja ecological zones." The earliest known use of soybean in the Nigerian diet was in the form of dawadawa, a fermented soup condiment traditionally made from the locust bean. Presently most of the dawadawa produced in Nigeria uses soybean as its raw material. Production has spread to various parts of the country and there has been a marked improvement in processing techniques. Soy ogi and soymilk have also been used as foods in Nigeria. Since 1984 the Kersey Children's Home in Ogbomosho has run a clinic to treat malnourished children. About 24,000 out patients were treated in 1984 while at any given time about 40 severely malnourished children are admitted and placed on a diet consisting mainly of soymilk and traditional foods fortified with soybeans.

In Nigeria, the lack of recognition of the potential of the soybean is now a problem of the past. The greatest potential is expected to lie in the preparation of Nigerian foods. A book titled "Soybean Recipes" has been published. People in rural households in Nigeria are now learning to use soybeans. "The extension work with soybean utilization commenced at 3 project sites in Oyo State, i.e. Igangan, Ikoyi, Ijaye. Training and demonstrations take place at these sites, in which the villagers participate. The program has since expanded to 27 other villages.

"As a result of these training programs over 25,000 people have been trained and now soybean is found in local markets. The demand for utilization is increasing.

"Also, within the past few years, there are in the markets several soy fortified products like Nutrend, Golden morn, Nutrimax, etc. There are also whole soy products like soy nuts, soybean oil and liquid soy maggi [HVP soy sauce]. It is expected that several others will still enter the market this year.

“The future: While emphasis is presently being placed on the preparation and utilization of soybean at home, there is likely going to be a shift to commercial control processing of soybean... With the reduction in the availability of groundnut coupled with its soaring prices, soybean will play a more vigorous role in the formulation of livestock feed, with the possibility of reduction in feed cost and consequently of livestock produce.” Address: 1. International Inst. of Tropical Agriculture (IITA), PMB 5320, Oyo Rd., Ibadan, Nigeria; 2. Inst. for Agricultural Research and Training (IAR&T), Ibadan, Nigeria.

1291. Okada, Noriyuki. 1989. Role of microorganisms in tempeh manufacture—Isolation of vitamin B-12 producing bacteria. *JARQ (Japan Agricultural Research Quarterly)* 22(4):310-16. March. [12 ref. Eng]

• **Summary:** The vitamin B-12 content of tempeh made in Indonesia was found to be 4.6 micrograms (mcg) per 100 gm fresh weight, much higher than any other vegetarian food tested. But this was based on one sample transported slowly from Indonesia to Japan and its smell was no good when the value was measured. A sample brought quickly from Indonesia with good smell contained 0.7 mcg/100 gm. A sample prepared in Japan with tempeh starter from Indonesia contained only 0.05 mcg. And tempeh prepared in Japan with *Rhizopus oligosporus* NRRL 2710 contained 0.03 to 0.06 mcg/100 gm. Other vegetarian foods containing significant amounts of vitamin B-12 were thua-nao (Thailand) 1.5 mcg and fermented tofu (Singapore, also called Sufu) 1.1 mcg. Flesh-based foods with a high B-12 content included Ka-pi shrimp paste (Thailand) 5.3 mcg, fermented shrimp (Thailand) 2.5 mcg, and fish sauce, 3 month fermentation (Thailand) 2.4 mcg. The vitamin B-12 in vegetarian foods is produced by the fermentation process and it increases during fermentation. Flesh foods contain their own B-12. The daily requirement of vitamin B-12 for adults is estimated to be 3 mcg.

Bacteria that produced vitamin B-12 in tempeh were isolated and identified. The most prolific producer was *Klebsiella pneumoniae*, which had a maximum relative B-12 productivity of 1350. All prolific producers were members of the genus *Klebsiella* but some *Bacillus* species also produced B-12. The author suggests that intraspecific cell fusion techniques might be used to transfer this ability to *Bacillus natto*, the natto bacterium, which is presently unable to produce vitamin B-12. Address: Dep. of Applied Microbiology, National Food Research Inst., Tsukuba, Ibaraki 305, Japan.

1292. Rickman, Phyllis C. 1989. Tokyo Rose just wants to have fun. *Washington Post*. May 21. p. M35.

• **Summary:** This is a review of the restaurant Tokyo Rose (2427 18th St., NW, Washington, DC). This popular Adams-Morgan Japanese restaurant, a place to have fun, “serves four

tofu appetizers, one of them *hasamiage*, which two different waiters said “tastes scary.” The reviewer accepted the challenge and was broad-minded enough to like it, although it looked like “blintzes in a tofu wrapper.”

“Cold tofu, mashed with avocado and raw quail egg, and grilled tofu with natto turned out to be only weird rather than frightening. Tofu almond fry (which seems to be broiled, rather than fried, almond-crusting bean-curd triangles) is, I’m relieved to say, delicious.”

Grilled clams or oysters were served with a “sweetened soy glaze.” And “sea trout or seafood brochettes are brushed with sweetened soy and caramelized under the grill so the flesh is moist and crunchy.”

1293. Library of Congress, Subject Cataloging Div., Processing Services. 1989. Library of Congress subject headings. 12th edition. Washington, DC: Cataloging Distribution Service, Library of Congress. 3 volumes.

• **Summary:** This 12th edition (LCSH 12) contains approximately 173,000 headings established by the Library through Sept. 1988. The book was available on 3 May 1989. Approximately 10,000 headings were added since the 11th edition in 1988. Among these headings are 139,000 topical subject headings, 22,000 geographic subject headings, 10,000 personal names (incl. 9,000 family names), 2,600 corporate headings. This book should be used with the Subject Cataloging Manual (1989. 3rd ed.).

These subject headings have been accumulated by LC since 1898 and the first edition of LCSH was printed between 1909 and 1914. Subject headings are listed in boldface type. Approximately 40% of headings are followed by LC class numbers, which are added only when there is a close correspondence between the subject heading and the provisions of the LC classification schedules.

References show the relationship between terms: (1) The equivalence relationship: Use of UF (Use for) references. (2) The hierarchical relationship: Broader terms (BT) and narrower terms (NT). BT and NT function as reciprocals. A term appearing as a BT must be matched by the reversed relationship as an NT (e.g., Motor Vehicles. BT Vehicles. NT Trucks). (3) The associative relationship: Related terms (RT. Ornithology. RT Birds). May Subd Geog (MSG) = May subdivide geographically. Soy related subject headings, listed alphabetically, are:

Fermented soyfoods (MSG). BT Food, Fermented. Soyfoods. NT Fermented soymilk. Miso. Natto. Soy sauce. Tempeh.

Fermented soyfoods industry (MSG). BT Soyfoods industry. NT Miso industry. Nattô industry. Soy sauce industry. Fermented soymilk (MSG). BT Fermented soyfoods. Soymilk.

Hydrogenation [QD281.H8]

Information storage and retrieval systems—Soyfoods.

Lecithin [QP752.L4 (Physiology), or RM666.L4



(Therapeutics)]. UF Phosphatidylcholine. BT Phospholipids. NT Lysolecithin. Also: Lecithinase.

Margarine (MSG) [TP684.M3 (Manufacture)]. UF Butter, artificial, Margarin, Oleomargarine. BT Oils and fats, edible. NT Vanaspati. Margarine industry (MSG) [HD9330.M37-374] BT Oil industries. NT Vanaspati industry.

Meat substitutes [TX838]. BT Food substitutes.

Vegetarianism.

Miso (MSG) [TP438.S6 (Manufacture)]. UF Paste, Soybean. Soybean paste. BT Fermented soyfoods. NT Cookery (Miso).

Miso industry (MSG). BT Fermented soyfoods industry.

Nattô (MSG) [TP438.S36 (Manufacture)] [TX558.S6 (Nutrition)]. BT Fermented soyfoods.

Nattô industry (MSG). BT Fermented soyfoods industry.

Natural food restaurants (MSG). UF Restaurants, Natural food. BT Restaurants, lunch rooms, etc. RT Food, Natural.

Natural foods industry (MSG) [HD9000-HD9019]. UF Health foods industry. BT Food, Natural. Note: Natural food (Use Food, Natural). Natural food cookery (Use Cookery (Natural foods)).

Nonfermented soyfoods.

Nonfermented soyfoods industry.

Shortenings—Use Oils and fats, edible.

Soy ice cream (MSG). Here are entered works on no-dairy frozen desserts in which soy protein largely or completely replaces the dairy proteins. UF Ice cream, Soy. Soymilk ice cream. Tofu ice cream. BT Non-dairy frozen desserts. Nonfermented soyfoods.

Soy ice cream industry (MSG) [HD9330.S63-HD9330.S633]. BT Nonfermented soyfoods industry.

Soy sauce (MSG) [TP438.S6 (Manufacture)]. [TX407.S69 (Nutrition)]. UF Sauce, Soy. Soy. Soya Sauce. BT Fermented soyfoods. NT Cookery (Soy sauce).

Soy sauce industry (MSG) [HD9330.S65-HD9330.S653]. BT Fermented soyfoods industry. NT Strikes and lockouts—Soy sauce industry.

SOYA (Information retrieval system [SoyaScan from Soyfoods Center]) [Z695.1.S68]. BT Information storage and retrieval systems—Soyfoods.

Soybean (MSG) [QK495.L52 (Botany)]. [SB205.S7 (Culture)]. UF Glycine max. Soja bean. Soja max. Soy-bean. Soya. Soya bean. BT Beans. Forage plants. Oilseed plants.

Soybean—Diseases and pests (MSG). NT Diaporthe phaseolorum. Heterodera glycines [Nematodes]. Soybean mosaic disease. Soybean rust disease.

Soybean as feed [SF99.S]. NT Soybean meal as feed.

Soybean flour. UF soya flour. BT Flour. Soybean products.

Soybean glue. BT Glue. Soybean products.

Soybean industry (MSG) [HD9235.S6-HD9235.S62]. BT Vegetable trade. NT Soybean oil industry.

Soybean meal (MSG). UF Soybean oil meal. Soybean

oilmeal. BT Meal. Soybean products

Soybean meal as feed [SF99.S]. BT Soybean as feed.

Soybean mosaic disease (MSG) [SB608.S7]. UF Soybean chlorosis. Soybean leaf curl. BT Soybean—Diseases and pests. RT Soybean mosaic virus.

Soybean mosaic virus. BT Plant viruses. RT Soybean mosaic disease.

Soybean oil (MSG) [TP684.S]. UF Bean oil. Chinese bean oil. Soy oil. BT Drying oils. Soybean products.

Soybean oil industry (MSG) [HD9490]. BT Soybean industry.

Soybean oil mills (MSG). BT Oil mills. Soybean processing plants.

Soybean processing plants (MSG). BT Factories. Food processing plants. NT Soybean oil mills.

Soybean products (MSG). NT Soybean flour. Soybean glue. Soybean meal. Soybean oil. Soyfoods.

Soybean rust disease (MSG) [SB608.S7]. UF Rust disease of soybean. BT Fungal diseases of plants. Soybean—Diseases and pests. RT Phakopsora pachyrhizi.

Soyfoods (MSG). [TX401.2.S69 (Nutrition)]. [TX558.S7 (Composition)]. UF Soybean as food. BT Food. Soybean products. RT Cookery (Soybeans). NT Fermented soyfoods. Nonfermented soyfoods.

Soyfoods industry (MSG) [HD9235.S6-HD9235.S62]. BT Food industry and trade. NT Fermented soyfoods industry. Nonfermented soyfoods industry. Soymilk industry.

Soymilk. UF Beverages, Soy. Milk, Soy. Milk, Soybean. Soy beverages. Soy milk. Soybean milk. BT Nonfermented soyfoods. NT Fermented soymilk.

Soymilk industry (MSG) [HD9235.S6-HD9235.S62]. UF Soy milk industry. Soybean milk industry. BT Soyfoods industry.

Tempeh (MSG) [TX558.T39]. UF Bongkrek. Tempe. BT Fermented Soyfoods. RT Cookery (Tempeh).

Tofu (MSG).

Note: Changes in this edition from the 11th edition. Changed: Soybean as food to Soyfoods. Changed: Soybean milk to Soymilk. Changed: Soybean milk industry to Soymilk industry. Added: Soyfoods industry. Added: Fermented soyfoods. Added: Fermented soyfoods industry. Added: Nonfermented soyfoods. Added: Nonfermented soyfoods industry. Added: Fermented soymilk. Address: Washington, DC.

1294. Kanasugi, Goro. 1989. Zen-Nô-Ren tenpe jigyô-kô [The Japan National Natto Association's thoughts on the tempeh industry]. *Shokuhin Kogyo (Food Industry)* 32(12):41-47. [Jap]  
Address: Zenkoku Natto Kyodo Kumiai Rengokai, Fuku Kaicho.

1295. **Product Name:** [Natto].

**Foreign Name:** Nattô.

**Manufacturer's Name:** Natto Future Food.

**Manufacturer's Address:** Tourslaan 35, 5627 KW Eindhoven, Netherlands. Phone: 31 040-415257.

**Date of Introduction:** 1989. June.

**Ingredients:** Soybeans (organically grown), water, *Bacillus subtilis* culture.

**Wt/Vol., Packaging, Price:** 100 gm plastic tub (free of PVC).

**How Stored:** Refrigerated.

**New Product–Documentation:** Letter from Frans M.G. van



der Steen, founder and owner. 1991. Nov. 24. He is a small manufacturer of natto. Letter, label, photo of product, and brochure sent by Frans M.G. van der Steen. 1991. Dec. 22. He started making natto and selling it commercially on 14 June 1989. He got interested because macrobiotic friends asked him to make natto after he had been making tempeh for a while. At that time, the only way to get natto was to buy it frozen at a Japanese grocery store in Amsterdam—60 miles away. A year later he found a natural food distributor for his natto, but sales were too slow, so after a year he stopped distributing the product. Frans now makes natto in his home and sells about 10 kg/week. Recently Frans found a “new” market: the Japanese grocer in Amsterdam. Now Japanese people in Holland have become his best customers. He is presently investigating the possibility of exporting his natto to Dusseldorf, Germany, where approximately 15,000 Japanese live.

Label. 4.5 by 3.5 by 1 inch. Green on white. Thick glossy paper sleeve. Illustration of green grasses—somewhat resembling bamboo. “Natto is rich in protein and completely



free of lactose and cholesterol. Combined with rice, natto is a product rich in protein of the best quality and can replace meat, fish and dairy products. Contains no additives.” The 6-panel brochure (copyright 1991) in Dutch tells about natto and gives 6 recipes.

1296. Kim, Seung Ho; Kwon, Tai-Wan. 1989. Vegetable protein foods in Korea. In: T.H. Applewhite, ed. 1989. Proceedings of the World Congress on Vegetable Protein Utilization in Human Foods and Animal Feedstuffs. Champaign, IL: American Oil Chemists' Society. xii + 575 p. See p. 439-42.

• **Summary:** Contents: Abstract. Introduction. Situation of

**NATTO-tofu balletjes**

100 gram natto,  
1 blok tofu (250 gram),  
2 eetlepels arrowroot,  
1 eetlepel geroosterde sesam-zaadjes,  
1 eetlepel geraspte gember,  
2 eetlepels shoyu,  
halve theelepel zout,  
1 eetlepel mosterdzaadjes.  
Knijp met behulp van keukenpapier zoveel mogelijk vocht uit de tofu. Hak de natto klein. Verkrummel de tofu in een vijzel en voeg de overige ingrediënten toe. Stamp kort en vorm er balletjes van.  
Frituur ze goudbruin.

**NATTO in honing**

Los 3 eetlepels natto op in 500 gram honing en voeg een halve ontvelde en in dunne schijven gesneden citroen toe. Het lekkerst na 3 à 4 dagen. Serveer als marmelade op brood of rijstwafel.  
3 maanden houdbaar buiten de koelkast.

**NATTO met spinazie**

100 gram natto klein gehakt. Kook 500 gram verse spinazie gaar en koel onmiddellijk af in koud water.  
Knijp het vocht uit de spinazie en snij kort.  
Vermeng met natto en maak op smaak met shoyu.

NATTO is al meer dan 2000 jaar oud en komt oorspronkelijk uit het land van de rijzende zon.  
Het is een eiwitprodukt op basis van sojabonen en een fermentatiecultuur. Deze cultuur zorgt voor de bijzondere smaak en geur en de kenmerkende kleverige draden.  
In Japan is NATTO het nationale 'health food'.

**Analyse per 100 gram**

eiwit gr	16,5
vocht gr	59,5
vet gr	10,0
koolhydraten gr	9,8
calcium mg	90
fosfor mg	190
ijzer mg	3
natrium mg	2
kalium mg	660
vit. B1 mg	0,07
vit. B2 mg	0,06

Bron: Natto Nutricious Food

(C) 1991  
Natto Future Food  
Tourslaan 35  
5627 KW Eindhoven  
Nederland  
tel. 040-415257

**NATTO**

Een opvallend plantaardig eiwit

**Wat is NATTO?**

NATTO is een hoogwaardig eiwit in combinatie met rijst, en kan vlees, vis en zuivel vervangen.  
NATTO laat zich met geen enkel ander plantaardig eiwit vergelijken.  
NATTO zal U ongetwijfeld verrassen, niet alleen de smaak, maar ook de geur en de structuur zijn ongekend. De smaak is een uitdaging die, eenmaal overwonnen, U niet meer loslaat!

**NATTO is absoluut:**

- 100% plantaardig
- cholesterol vrij
- lactose vrij
- vrij van additieven
- van biologische sojabonen

NATTO is eenvoudig in het gebruik. Meng het met o.a. mosterd, ui, mayonaise en prei en U hebt snel in combinatie met rijst een eiwit op tafel of voor laat op de avond een hartige snack.

Aan NATTO wordt een heilzame werking toegeschreven.  
Het reinigt het darmstelsel en zorgt voor een gave huid.

Het maakt bloedaders soepel en verhoogt de weerstand tegen ziektekiemen.

NATTO is bijzonder licht verteerbaar in tegenstelling tot veel andere bonen.

U vindt NATTO in de koeling of in de diepvries.

Neemt u NATTO uit de diepvries dan kunt u het beste deze ruim een half uur voor gebruik laten ontdooien.

**NATTO spread**

100 gram natto (1 doosje),  
1 eetlepel mayonaise,  
halve theelepel mosterd,  
1 eetlepel fijn gesneden prei of ui of bosui.  
Pureer alle ingrediënten. Serveer op een toastje of rijstwafel.

**NATTO bij de rijst.**

Stamp in vijzel fijn:  
1 doosje natto (100 gram),  
halve eetlepel boter,  
1 teentje knoflook,  
1 theelepel jonge miso.  
Maak op smaak met shoyu en serveer op vers gekookte rijst. Garneer met bosui.

**NATTO salade**

Spoel 100 gram natto in een zeef grondig af en laat uitlekken.  
Snij 25 gram kaas in zeer kleine dobbelsteentjes.  
Hak een kwart friszure appel in kleine stukjes.  
Maak een dressing van 2 eetlepels azijn, 4 eetlepels olie en een halve theelepel mosterd.  
Scheep alles door elkaar en serveer op een blad ijsbergsla.

traditional protein foods. Situation of vegetable proteins. Traditional protein foods in Korea: Soy sauce (*kan jang*), hot soy paste (*ko chu jang*), *chung kuk jang* (a kind of soy paste made by mixing natto [*naap doo*] with seasonings [salt, red pepper, and garlic], and grinding then aging the mixture), soybean sprouts (*kong na mool*).

Note: This is the earliest English-language document seen (March 2009) that uses the term “*ko chu jang*” to refer to Korean-style red pepper and soybean paste (miso).

Note 2. This is the earliest English-language document seen (Jan. 2012) that uses the term “*chung kuk jang*” to refer to Korean-style natto.

Tables: (1) Domestic Korean production and import of soybeans from 1982 to 1987. Domestic production rose to 250,000 tonnes from 233,000 tonnes. Imports for food uses rose to 144,000 tonnes from 104,000 tonnes. Imports for feed uses rose to 936,000 tonnes from 479,000 tonnes. Total supply rose to 1,330 tonnes from 816 tonnes, up 63% in 5 years.

(2) Consumption of soybeans in traditional Korean foods, in 1,000 metric tons, from 1982 to 1987 (1982/1987). Figures in parentheses are for home production. Soy sauce (*kan jang*) 69(50)/70(51). Soy paste (*doen jang* [Korean soybean miso]) 51(41)/50(40). Hot soy paste (*ko chu jang*) 5(4)/5(4). Soybean curd (*doe bu*) 60/114. Soy milk (*doe yoo*) 7/14. Others: Homemade soybean curd and soy milk, *chung kuk jang*, *choon jang* (kinds of soy paste), soybean sprouts (*kong na mool*), and whole soybeans 145/141. Total 337/394, or an increase of 19.9% in 5 years.

Note: This is the earliest English-language document seen (March 2009) that uses the term “*choon jang*” to refer to Korean-style soybean paste (miso).

(3) Domestic production and import of soybeans in Korea (Estimated for 1987, in metric tons): Soy protein–Textured vegetable protein (domestically made) 4,500. Soy protein isolate (import) 1,800. Soy protein concentrate (import) 150. Wheat protein–Textured vegetable protein (domestic) 900. Vital gluten (domestic) 150. Gluten (wet & dry) (import) 409. Total 7,909.

(4) Nutritional composition of soybeans and soybean sprouts (per 100 gm).

Figures show: (1) Manufacturing method for rice hot soy paste (*ko chu jang*) (flow sheet). Numbers represent typical ratio of ingredients in volume. (2) Manufacturing method for chunk kuk jang (a type of soy paste) (flow sheet). Numbers represent typical ratio of ingredients in volume.

A photo shows one of the authors. Address: Korea Food Research Inst., P.O. Box 131, Chongryang, Seoul, South Korea.

1297. Thornbury, B.E. 1989. Global pursuits: Salad doughnuts and other Japanese delicacies. *Washington Post*. Aug. 6. p. E1.

• **Summary:** She first arrived in Japan 15 years ago, and

when she is away, her thoughts begin to dwell on all the treats that she is missing. “But one of the greatest gustatory challenges of Japan comes in the form of beans: the little red [*azuki*] beans that are boiled, mashed, sugared and turn up with regularity in traditional Japanese sweets; and the soybeans that are fermented until they are slimy and odoriferous and then served—sometimes whipped up with raw egg, mustard and onion—and poured over hot rice. The latter are called *natto*. When you say that you are a devotee of Japanese food, you will invariably be asked, ‘But do you like *natto*? Answer honestly. Many Japanese people don’t care for *natto* either.’”

1298. Gaec de La Lix: United Macrobiotic Company. 1989. Re: Work with soyfoods and seitan in France. Letter from Ben of Gaec to Anthony Marrese, Sept. 25. 1 p. Typed, with signature on letterhead. [Fre]

• **Summary:** “Since October 1985 we have been building up our project. We are 20 adults and meanwhile three children. Four years ago we bought a very nice farm in the beautiful landscape of the Pre-Pyrenees 80 kilometers southwest of Toulouse. Today we work on more than 90 hectares of land.

“At the beginning we started by establishing a common macrobiotic kitchen. We worked mainly in the garden and in the fields, trying ideas of permaculture and those of Masanobu Fukuoka. In this behalf we were assisted by Thomas Nelissen, who lived for some time at Fukuoka’s farm in Japan, and Declan Kennedy, the most important teacher of permaculture in Europe...

“This is our fourth year growing soybeans. We have a garden of one and a half hectares, mostly for self-sufficiency.

“With a status as ‘transformateurs’ we set up a stand on the organic market (“*marche bio*”) at Toulouse, shortly after we started to make tofu for ourselves. In time we began to make tempeh, natto... certain types of soyburgers, sushis and vegetable rolls. Today we deliver our products to more than 40 biological [organic] health stores in the surrounding 100 kilometers...

“We teach the making of tofu and seitan, amasake, mochi and tempeh as well as giving macrobiotic cooking classes and agricultural seminars.”

A 1989 leaflet titled “What are Tofu, Tempeh, Seitan, Kombu?” in French (4 panels) is included with the letter. A color slide showing five people from the company waving is taped to the letter. Address: 32260 Tachaires–Seissan, France. Phone: 62.65.35.04.

1299. Abbey, B.W.; Phillips, R.D.; McWatters, K.H. 1989. Preparation and uses of legumes and oilseeds in Africa. In: E.W. Lusas, D.R. Erickson, and Wai-Kit Nip, eds. 1989. Food Uses of Whole Oil and Protein Seeds. Champaign-Urbana, IL: American Oil Chemists’ Society. vii + 401 p. See p. 281-304. Chap. 18. Proceedings of the Short Course on Food Uses of Whole Oil and Protein Seeds held at Makaha,

Hawaii, May 11-14, 1986. [20 ref]

• **Summary:** Discusses general methods of processing and using the following: Cowpeas (*Vigna unguiculata*; also known as beans, black-eyed peas). Pigeon peas (*Cajanus cajan* Druce; also known as red grain, Congo pea, non-eye pea). The oilpalm (*Elaeis guineensis* Jacq.). Groundnut (*Arachis hypogea*; also known as peanut, monkey nut). Water melon seed (*Citrullus vulgaris* Schrad; used to make egusi soup in Nigeria).

African locust bean (*Parkia filicoides*; known as Dawadawa [Hausa], Irugba [Yoruba], Ogiri-Igala [Ibo/Igbo]). African oil bean seed (*Pentaclethra macrophylla*; also known in Igbo/Ibo as Uba, Ogiri). Bambara groundnuts (*Voandzeia subterranea* Thouan).

Table 18.2, titled "Utilization of traditional food legumes," includes the soybean. It is most frequently used as a source of vegetable oil or vegetable milk, frequently utilized in composite flour, and least frequently utilized as follows: boiled as a main meal or snack; boiled and eaten with starchy root, yam, or plantain; in soup/stew as a meat/fish supplement; in gruel or porridge, spiced or sweetened; cooked with cereal grains such as rice, millet, or maize; roasted as a snack; in a paste as a spread; or fermented as a food condiment. Also discusses the limitations and advantages of traditional food processing, upgrading traditional food processing techniques, and summary. Address: 1. Dep. of Biochemistry, Univ. of Port Harcourt, Port Harcourt, Nigeria; 2-3. Dep. of Food Science, Univ. of Georgia Agric. Exp. Station, Griffin, GA 30223-1797. Phone: 2&3: 404-228-7284.

1300. Griffis, Gil; Wiedermann, Lars. 1989. Marketing food-quality soybeans in Japan. American Soybean Association. Sept. \*

• **Summary:** This report was published in Jan. 1989, mainly for the American Soybean Association's Tokyo office. Address: 1. American Soybean Assoc., Division Manager; 2. Japan Country Director, American Soybean Assoc.

1301. Johnson, Dale W. 1989. General uses of whole soybeans. In: E.W. Lusas, D.R. Erickson, and Wai-Kit Nip, eds. 1989. Food Uses of Whole Oil and Protein Seeds. Champaign-Urbana, IL: American Oil Chemists' Society. vii + 401 p. See p. 12-29. Chap. 2. Proceedings of the Short Course on Food Uses of Whole Oil and Protein Seeds held at Makaha, Hawaii, May 11-14, 1986. [35 ref]

• **Summary:** Contents: Introduction: Introduction. Oriental nonfermented products: Yuba, kinako Thai desserts (tofu guan, med khaon), Thai foods (protein crisp, cooked baby food, canned evaporated soybean milk, taow-huey, kanom ping kaset). Fermented foods: Natto, hama-natto, tao tjo (a miso-type product made in Indonesia and Thailand), ontjom (made from peanuts, coconut press cake, or okara), kochu chang, ketjap, sufu, yogurt-type products, tauco, soy

sauce, miso, tempeh. Western world type products. Full fat soy flour (enzyme active, heat treated). Soybean hulls. Whole soybeans in animal feed. Chapatty [chapati]. Full fat soy grits. Heat treatment of soybeans. Heat treatment and texturizing. Low-fat products. Snacks (soynuts—dry roasted or oil roasted, plain or seasoned). Soybean sprouts. Soy butter [soynut butter]. Combinations of soybeans and cereals. Soybeans as vegetables (mao-tou, edamame, or fresh green soybean). Defatted products. Nutrition. Soybean handling and equipment considerations. Solvent plant considerations. Address: Food Ingredients (Minnesota) Inc., 2121 Toledo Ave. North, Golden Valley, Minnesota 55422.

1302. Smith, Keith J. 1989. World production, availability and variety differences of soybeans. In: E.W. Lusas, D.R. Erickson, and Wai-Kit Nip, eds. 1989. Food Uses of Whole Oil and Protein Seeds. Champaign-Urbana, IL: American Oil Chemists' Society. vii + 401 p. See p. 1-11. Chap. 1. Proceedings of the Short Course on Food Uses of Whole Oil and Protein Seeds held at Makaha, Hawaii, May 11-14, 1986. [11 ref]

• **Summary:** Contents: Introduction. Composition. Required characteristics: For soy milk, tofu, miso, natto, soy sprouts. Conclusions.

The most desired characteristics of soybeans for food processing include: Large seed size, high protein content, high quality, reasonable price. The characteristics desired for each of the soyfoods mentioned above are given.

Table 1.1 shows world production of the eight major oilseeds in million metric tons from 1981-82 to 1985-86. Over this 5-year period, total production of the eight oilseeds has grown by 14.6%, from 169.4 to 194.2. In descending order of production, the eight are: Soybean 96.0. Cottonseed 34.1. Peanut 19.7. Sunflowerseed 18.6. Rapeseed 18.6. Copra (dried coconut meat, 5.0). Flaxseed 2.6. Palm kernel 2.3. Source: Foreign Agricultural Service, USDA. Address: American Soybean Assoc., P.O. Box 27300, St. Louis, Missouri 63141.

1303. *SoyaScan Notes*. 1989. Influence of Japanese and Japan on soyfoods in America (Overview). Dec. 7. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** The Soyfood Center's SoyaScan database presently contains 30,790 publications and commercial products related to soya. Of these, 876 (2.9%) concern the influence of Asian-Americans (Japanese, Chinese, Koreans, or Indonesians) or their home countries on soyfoods. Of these 876 records, 638 (73%) concern Japanese influence, compared with 178 (20%) that concern Chinese influence—including Chinese from Taiwan, Hong Kong, Singapore, etc. Thus Japanese influence on soyfoods in America is much greater than that of any other Asian cultural group. We can identify at least seven major areas of influence:

1. Soyfoods Terminology. It is interesting to note that

many of the most popular soyfoods in America are most widely known by their Japanese names. We say tofu (not doufu or bean curd), miso (not jiang or soybean paste), natto, okara (not soy pulp), yuba (not doufu-p'i or soybean skin). Even "soy" (as in soy sauce) is derived from the Japanese word "shoyu." Increasingly Americans interested in natural foods also use the terms shoyu and tamari to distinguish them from HVP soy sauce.

2. Kikkoman. By far the most influential Japanese soyfoods company in America today is Kikkoman, just as soy sauce is by far the most important soyfood product. Kikkoman was also the first Japanese company to introduce soyfoods to America. In 1868 the first Japanese immigrants to Hawaii took kegs of Kikkoman brand shoyu with them. In 1879 Kikkoman brand shoyu was registered in California, where it was exported to Japanese immigrants. Exports rose steadily, until between 1949 and 1954 exports of Kikkoman shoyu to the U.S. ranged from 213,000 to 305,000 gallons a year. Kikkoman's first real attempt to reach any foreign market dates from 1956 when, during the U.S. presidential elections, Kikkoman ran television ads to promote its product to mainstream American audiences as a seasoning for meat, fish, and poultry. In 1957 Kikkoman International Inc., a new sales company was established in San Francisco. Sales skyrocketed. In 1973 Kikkoman opened a huge modern shoyu plant at Walworth, Wisconsin. In 1976 Kikkoman passed La Choy to become America's best-selling soy sauce.

3. Introducing Soyfoods to Hawaii. The first Japanese who arrived in Hawaii in 1868 brought shoyu and miso with them. The earliest known soyfoods company there was a shoyu brewery started in 1891 in Honolulu by Jihachi Shimada. This was also the earliest known soyfoods company started by a Japanese anywhere in the Western world. Hawaii became part of the USA in 1898 by annexation. Hawaii and California were the first two areas in the U.S. where soyfoods became widely available. During the 20th century, Japanese started roughly 183 companies in Hawaii making shoyu, miso, and tofu—far more than Chinese (6) or Koreans (2). They developed innovative new products—such as sweet Hawaiian-style shoyu and miso. These products profoundly influenced the food life of Hawaii.

4. Soyfood Manufacturers in the USA. The earliest known soyfoods manufacturer in the Continental USA was a company (the name is unknown) run by the wife of Chieko Hirata that started making tofu in Sacramento in about 1895. The second earliest was Yamamori Jozo-sho, which started making shoyu in San Jose, California, in 1897. Many of the earliest soyfoods companies in America were run by Japanese Americans. By 1942 at least 158 soyfoods manufacturing companies had been started in America by Asian Americans; of these, 143 (91%) were run by Japanese Americans. When *The Book of Tofu* was published in 1975, it listed 55 tofu companies in America, all run by Asian-

Americans; 39 were Japanese- and 16 were Chinese-run. Today America's two largest tofu companies are both run by Japanese Americans: Azumaya Co. in San Francisco, and House Foods & Yamauchi Inc. in Los Angeles. Hawaii's three largest tofu companies are also run by Japanese Americans: Aloha Tofu Co., Kanai Tofu Factory, and Hawaii Tofu. Morinaga Nutritional Foods in Los Angeles and Kikkoman Foods in San Francisco both import large amounts of aseptically packaged long-life silken tofu from Japan.

Another major manufacturer is San-Jirushi Corp. of Kuwana, Mie-ken. In the late 1970s San Jirushi started exporting tamari and soybean miso to America. They set up an office in the early 1980s and began to promote their product as "real" tamari to industrial food processors and the natural foods market. In Sept. 1987 the company opened a state-of-the-art tamari plant in Richmond, Virginia, with a capacity of 1 million gallons a year. The company now has 75% of the industrial soy sauce market in America.

In Oct. 1986 a major new joint stock company named American Soy Products began producing Edensoy soymilk in Clinton, Michigan. It was a joint venture between Eden Foods and 4 Japanese companies: Marusan Ai, Kawatetsu Shoji, Muso Shokuhin, and Seikensha. Edensoy has since become America's best-selling soymilk. Prior to 1986 much of the soymilk sold in America was made in Japan.

Finally, three of America's 4 largest miso manufacturers are run by Japanese-Americans. The largest is Miyako Oriental Foods in Los Angeles. The other two are located in Hawaii.

5. Soyfoods Imports from Japan. The first importers of shoyu and miso were Japanese distributors such as Japan Foods Corp., Mutual Trading Co. and Nishimoto. But starting in 1962 American macrobiotic and natural foods companies started to import large amounts of shoyu and miso. Pioneers were Chico-San, Erewhon, Eden Foods, Westbrae, Edward & Sons, Tree of Life, and Great Eastern Sun. U.S. imports of soy sauce from Japan jumped from 1.7 million lb (174,400 gallons, worth \$317,000) in 1949, to 18.6 million lb (1,897,000 gallons, worth \$3,116,000) in 1972, an 11-fold increase in quantity during only 23 years.

6. Teachers and Information. Many Americans first learned about soyfoods from Japanese teachers, especially macrobiotic teachers, such as George and Lima Ohsawa, Michio and Aveline Kushi, Herman and Cornelia Aihara, and Noboru Muramoto. All have written many influential books and lectured and taught extensively since the 1960s. In addition, many young Americans learned how to *make* soyfoods from these macrobiotic teachers. Moreover, Japan is Asia's best source of information about soyfoods. For example, the Soyfoods Center's SoyaScan database contains 5,095 publications and products about soya and Japan, compared with 1,867 on soya and China or Taiwan.

7. Tofu Equipment Manufacturers. Hundreds of tofu

companies have started in America since the mid-1970s. The majority of these are run by Caucasian Americans and most use specialized tofu equipment made in Japan by Takai Tofu & Soymilk Equipment Co., or by Sato Shoji.

1304. Hesselstine, Clifford W. 1989. Re: Seasons greetings at Christmas (Folded card). Peoria, Illinois. 4 panels. Dec.

• **Summary:** Inside this Hallmark Christmas card (each panel is 6¼ by 4½ inches) is written by hand, in blue ink, on the right panel below the Hallmark greeting: “Still busy working on the natto fermentation [bibliography] but have been sidetracked repeatedly with other writing obligations.”

Note: The unpublished annotated bibliography, titled *Natto, a Little-Known Fermented Soybean Food*, was published in Nov. 1993. It was one of Dr. Hesselstine’s retirement projects. He sent a copy of this very valuable work to Soyfoods Center. Address: 5407 N. Isabell Ave., Peoria, Illinois 61614.

1305. Krieger, Verena. 1989. Soja als Nahrungsmittel: genutzt oder missbraucht? [Soya as a food: Used or misused?]. *Zum Beispiel (Switzerland)* No. 12. p. 15-17. Dec. 21. [Ger]

• **Summary:** Soybeans can be fermented to make miso, soy sauce, tempeh, or natto. Or the protein can be extracted in traditional ways to make soymilk, tofu, or yuba. One can also make soy sprouts. In the Western world, soybeans are mostly misused to make high-protein meal for livestock fodder, and vegetable oil. Address: Lucerne, Switzerland.

1306. Taira, Harue; Tanaka, Hiromi; Saito, M. 1989. [Total sugar, free type of total sugar, and free sugar contents of domestic soybean seeds]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 36(12):968-980. [Jap; eng]\*

Address: National Food Research Inst., Ministry of Agriculture, Forestry and Fisheries, 2-1-2 Kannondai, Tsukuba, Ibaraki 305, Japan.

1307. **Product Name:** [Natto].

**Foreign Name:** Natto.

**Manufacturer’s Name:** Daizou SARL.

**Manufacturer’s Address:** 883 Rue de Bernau–Z.I., 94500 Champigny sur Marne, France. Phone: 48 82 39 90 or 47.06.33.71.

**Date of Introduction:** 1989.

**Ingredients:** Soybeans, Bacterial culture (*Bacillus natto*).

**New Product–Documentation:** Form filled out by Anthony Marrese based on an interview with Mr. Hirayama. 1989. This product was introduced in 1989.

Talk with David de Korsak, who worked for Daizou. 1990. July 11. Daizou made natto for 6-9 months, from the last quarter of 1989 until about mid-1990. Then they stopped because of problems with contamination of their culture.

There is a big demand for fresh natto in Paris. Most natto is imported frozen.

1308. Jideani, I.A.; Poloma, H.; Ndukwe, N.J. 1989.

Effect of different fermentation conditions on organoleptic properties of “daddawa”—a Nigerian condiment. *Nigerian J. of Technol. Research* 1(2):83. \*

1309. Kato, Eihachiro. 1989. [Travels for natto in Africa—For the investigation of the spread of soybeans in West Africa by FAO]. *Daizu Geppo (Soybean Monthly News)* 156:18-26. [Jap]\*

1310. Kiuchi, Kan. 1989. Nattô [Natto]. In: Sozai to Ryôri [Food Materials and Dishes]. Tokyo: Gakushu Kenkyusha. See p. 194-95. [Jap]\*

1311. Food & Agriculture Organization (FAO). 1989.

Utilization of tropical foods: Tropical oil-seeds. Rome, Italy: Food & Agriculture Organization of the United Nations (FAO). xiv + 82 p. 21 cm. Series: FAO Food and Nutrition Paper 47/5. \*

• **Summary:** The 1st chapter, titled “Leguminous oil-seed crops, has these contents: Soybean (p. 1-35): The golden bean from China, varieties and production, soybeans in the tropics. Hydrolysis of soybeans using microbial enzymes. Nutritional and acceptability aspects of soybeans: Cooking characteristics, soybean flavour, digestibility of soybeans. Soybean processing in eastern Asia: Fermentation of soybeans. Fermentation inoculants: Koji and ragi, angkak and masam [a green fermentation starter from Nepal, made from wheat and selected moulds], preparation of koji. Preparation of soy sauce: Traditional Japanese shoyu, other types of soy sauce. Fermented soybean pastes: Types of miso, preparation of miso koji, preparation of mame miso, preparation of hamanatto. Other fermented soybean products: Natto and thua nao. Indonesian tempe: Preparation of tempe ragi, production of tempe kedele, other types of tempe, domestic use and nutritional content of tempe. Foods fermented by molds: Role of moulds in food processing, food safety aspects. Non-fermented soybean products: Production of soy milk, improving soymilk flavour. Soybean protein products: Preparation of tofu, preparation of yuba. Soybean cheese products: Preparation of sufu (“The Chinese prepare a fermented soy curd called *sufu*, which resembles a moulded, soft-texture cheese.” Red sufu is made using “red rice koji” (angkak)). Use of soy milk and tofu residues: Preparation of oncom tahu, preparation of meitauza. Use of soybean sprouts. Soybeans as a cash crop. Soybean as an oil-seed: Problems of small-scale extraction. Solvent extraction of soybean oil: Economic aspects, extraction process, refining operations. Nutritional and organoleptic aspects of soybean oil. Commercial production of vegetable fats and oils: Solid shortenings, effects of hydrogenation, hardness

of fats. Margarine production: Composition of margarine, manufacture of margarine. Production of soybean grits and flour. Commercial production of soybean protein products: Protein concentrates, protein isolates, economic aspects. Introduction of soyfoods at the village level: Snack foods, vegetable relish, pastes and flour. Preparation of soybeans at the village level: Reducing bitter flavours, preparation of soybean flour. Prospects for soybean products in the tropics.

Concerning the preparation of sufu (p. 21): "... the cubes [of tofu] are drained and heated for about 15 minutes at 100°C to sterilize them. The sterilized cubes are cooled, placed on trays, and inoculated with one of the following fungi: *Actinomucor elegans*, *Mucor lienialis*, or *Rhizopus chinensis* var. *chungyen*, depending on the type of 'cheese' to be produced. They are then incubated at 12-20°C for three to seven days. At that stage, the cubes become covered with a white mycelium and are known as *pehtzu* [*pehtze*].

"In the final stages, the cubes of *pehtzu* are transferred to ageing tanks, where they are immersed in a mixture of rice wine and salt, 2-5% sodium chloride, for forty to sixty days. The alcohol content of this 'dip' (approximately 10 percent) is much higher than that normally obtained by anaerobic fermentation using osmophilic [osmophilic] yeasts. The final product, after completing the ageing period, is soft and pale yellow, with a pleasant taste and aroma. It is often served with sesame oil. More pungent cheeses are prepared by related processes, by adding other components to the final brine solution. These may include red rice koji, fermented rice mash, anise or pepper. An outline of a preparation from Thailand, using red rice koji to give a red sufu is shown in Figure 3" (a flow sheet, p. 22; Source: Narudom Boon-Long. 1983. "Traditional fermented food products." United Nations University (UNU) Workshop Paper, CFTRI, Mysore, India).

The peanut from Peru (p. 36+).

1312. Fukushima, Danji. 1989. Historical development of soy sauce and fermented black soybeans in China (Document part). In: K. Steinkraus, ed. 1989. Industrialization of Indigenous Fermented Foods. New York and Basel: Marcel Dekker, Inc. xii + 439 p. See p. 2-8.

• **Summary:** "1. Chiang. In 1979, Kinichiro Sakaguchi proposed a unique hypothesis regarding the origin of soy sauce and miso as a result of historical biochemical investigations, and this hypothesis was later introduced by this author in English (Fukushima, 1985a, 1986b). However, new literature on the origin of soy sauce and miso appeared based on more detailed historical evidence (Pao 1982a, 1982b; 1984a, 1984b). According to these papers, soy sauce was derived from a Chinese food called 'chiang' ('hishio' in Japanese).

"Chiang is a tasty mash product and does not come in a liquid form. Therefore chiang belongs in the category of 'miso' in Japan. The first record of chiang can be found in the book entitled *Chou-li* (*Shurai* in Japanese) by Chou-

kung (*Shuko* in Japanese), which was published around 1,000 B.C. in the Chou (*Shu* in Japanese) dynasty (1,222 BC to 249 BC). This book covers the matters on the early years of the Chou dynasty in ancient China (about 3,000 years ago). According to this document, chiang was made by the following procedure. First, yellow aspergilli were grown on millet. (Such mold-grown cereals are called 'koji' in Japanese.) Then the millet koji and the meat of fish, flesh, or fowl and salt were mixed with a good liquor in a bottle and kept for 100 days. Soybeans were not used in this chiang. The first literature in which soybeans appeared as a substitute for meat in chiang was the *Ch'i-min Yao-shu* (*Saimin-Yojutsu* in Japanese) by Chia Ssu-hsieh (Ka Shikyo in Japanese), the world's oldest encyclopedia of agriculture, published in 535 AD in China. This indicates that the chiang in which soybeans was used originated sometime between the Chou and Han dynasties, when the cultivation of soybeans prevailed. The meats in the chiang described in *Chou-li* were gradually replaced by soybeans in the course of time and further cereals such as wheat, barley, and rice came to be used instead of millet, resulting in the production of many types of chiang. In the process of making chiang during these periods, soybeans were not used as a raw material in koji; rather they were added to the harvested koji prepared from the other cereals. The soybeans were digested by the enzymes of the koji. This digestion mixture was the final product, which was in the form of a mash. The liquid products which belong to the category of soy sauce did not appear in the literature before the later Han dynasty (about 25-220 A.D.).

"There is a description of the liquid product which was made by separating the liquid portion from the chiang in *Ssu-ming Yueh-ling* (*Shimin-Getsurei* in Japanese), published by Ts'ui Shih (Sai Shoku in Japanese) in the later Han dynasty. This liquid was called chiang ch'ing which means 'clear chiang.' The manufacturing processes of chiang and chiang ch'ing are shown in Figs. 1 and 2. Chiang ch'ing is a prototype of soy sauce but it differs from 'chiang-yu' which means literally shoyu or soy sauce in the Chinese characters. The first appearance of the name of chiang-yu was in *Shan-chia Ch'ing-kung* (*Sanya-Seikyo* in Japanese) by Lin Hung (Rin Ko in Japanese) in the Sung dynasty (960-1127 AD).

"The first record indicating use of all the raw materials to prepare koji for soybean chiang appeared in the *Nung-sung I-shin Ts'o-yao* (*Noso-Ishoku-Satsuyo* in Japanese) by Lu Ming-Shan (Ro Meizen in Japanese), published in the Yuan (Gen in Japanese) dynasty (1271-1368 AD). The flow sheet of this soybean chiang is shown in Fig. 3." (In this process, soybeans are roasted, dehulled, cooked, then mixed with wheat flour and spontaneously molded to form koji. The koji is dried in the shade, winnowed, and pounded, then mixed with spices and salt water to form a mash, which is insulated and aged to make the soybean chiang.) The chiang-yu described in *Pen-ts'ao Kang-mu* (*Honso-Komoku* in



Japanese), published in 1590 by Li Shih-chen (Ri Jichin in Japanese) in the Ming (Min in Japanese) dynasty, was also made with koji manufactured by using soybeans and cereals (Fig. 4). (In this process soybeans were cooked in water, mixed with wheat, and spontaneously molded to form koji. Salt water was mixed in with a paddle, then the mash was insulated and aged. Finally it was filtered to make chiang-yu). The ratio of soybeans to wheat in the koji making was 3:2. This ratio is very close to that used in making regular Japanese shoyu, which is made by using equal amounts of soybeans and wheat, as will be described later. The general manufacturing methods of soy sauce in the Ch'ing (Shin in Japanese) dynasty are recorded in *Ch'ing-yuan Lu* (*Seienroku* in Japanese), written by Li Hua-nan (Ri Kanan in Japanese). Cooked soybeans and uncooked wheat were the raw materials used in koji making. The resultant koji was mixed with brine. After aging, the soy sauce was collected by pressing a deep bamboo colander into the aged mash and ladling out the liquid which had accumulated.

“The original chiang was a mash-type product made with a koji that had been prepared from wheat, barley, rice, etc., and not from soybeans. Therefore, the soybean constituents were only changed through the *in vitro* biochemical reaction by the enzymes from the mold grown on the cereals. Accordingly, the degree of change of the soybean constituents was not very great and most of the soybean proteins were partially hydrolyzed into polypeptides through the *in vitro* enzyme action. The degree of liquefaction was not very large and the flavor was not as strong. In the case of chiang-yu, however, mold is grown on both the soybeans and cereals and, as a result, the soybean constituents are changed largely through the biochemical reaction both *in vivo* and *in vitro* by the mold throughout the entire process of manufacturing. Accordingly, much of the soybean constituents can be liquefied. The soybean proteins are hydrolyzed to single amino acids and, therefore, the flavor is sharp and strong in chiang-yu. Thus, it can be concluded that (a) the progenitor of miso is chiang, originated in China about 3,000 years ago; (b) the progenitor of soy sauce is chiang ch'ing, originated in China about 2,000 years ago; (c) chiang ch'ing had developed into chiang-yu in China and the regular type of shoyu called koikuchi in Japan at least 1,000 years ago.

“It is an amazing fact that the Chinese had utilized the enzyme action of mold in food manufacturing as early as 3,000 years ago. They deliberately selected yellow aspergilli from many types of aspergilli because they best facilitated the manufacture of chiang. If the definition of ‘biotechnology’ is to make the products necessary for the welfare of humans by using life phenomena, it can be said that people in ancient China had already produced foods by biotechnology as early as several thousand years ago. In this sense, it is not an exaggeration to say that soy sauce was a pioneer of the actual application of biotechnology.

“2. Shih. Shih is a fermentation product of soybeans, the form of which is a tasty nugget with or without salt. Shih is classified into five types by the kind of microorganism used in its manufacture. Those are *Aspergillus* type (called shih in the areas of Pei-ching, Hu-nan sheng, and Taiwan; and called hamanatto in Japan), *Mucor* type (shih in the area of Shan-tung sheng and natto in Japan), *Rhizopus* type (tempeh in Indonesia), *Bacillus* type (shih in the area of Shan-tung sheng and natto in Japan), and *Neurospora* type (oncom in Indonesia). The shih described here is the shih of *Aspergillus* type, which relates to soy sauce.

“The earliest literature in which shih appeared is *Shih-chi* (*Shiki* in Japanese) by Ssu-ma Ch'ien (Shiba Sen in Japanese), which was published in 85 BC. Shih is also described along with chiang in *Shuo-wen Chie-tzu* (*Setsubun-kaiji* in Japanese) by Hsu Shen (Kyoshin in Japanese), the oldest dictionary in China published in 121 AD in the later Han dynasty. The raw material of the shih is soybeans as shown in Fig. 5. (In the process described in the *Shi-ching* by Hsie Feng (which survives only in the *Ch'i-min yao shu*), soybeans are washed, soaked, drained, and steamed. The cooked soybeans are cooled, then spread, furrowed, and piled. The last 3 steps are repeated 3 times a day for 3 days until the beans have become spontaneously molded. The resulting soybean koji is mixed with soybean cooking liquid, barley koji, and salt, put into an earthen pot, sealed, and insulated. It is then dried in the shade, mixed with a mulberry leaf extract, and steamed. The last 3 steps are repeated 3 times, resulting in salted soybean shih. In the second process described in the *Ch'i-min yao-shu*, soybeans are winnowed, cooked, drained, and cooled. They are piled, the temperature is measured, and then they are stirred. The last 3 steps are repeated 3 times until they are spontaneously molded. They are then spread and furrowed to make soybean koji. This is winnowed, washed, drained, dried, moistened, piled, fermented, and dried to give unsalted soybean shih.) Therefore the resultant shih (soybean nugget) contains a high amount of protein. In shih, much of the soybean constituents are present in a liquid state. The soybean proteins are hydrolyzed to single amino acids and, therefore, the flavor is sharp and strong. The flavor constituents of shih can be extracted easily by a salt solution. The original shih was served as nuggets; the brine extract came to be used as a seasoning gradually. In *Chi-min Yao-shu* (535 AD), there is a description of about 70 kinds of cookeries using shih extracts. It should be mentioned that shih and its brine extract developed into today's tamari shoyu in Japan.”  
Address: Managing Director, Kikkoman Corp., Chiyoda-ku, Tokyo, Japan.

1313. Hesselstine, C.W. 1989. Fermented products. In: Ruth H. Matthews, ed. 1989. Legumes: Chemistry, Technology, and Human Nutrition. New York and Basel: Marcel Dekker, Inc. x + 389 p. See p. 161-85. [29 ref]

• **Summary:** Contents: Introduction: Fermented legume products. A table lists about 85 products with the vernacular name, legume from which it is made, country, and microorganism(s) used. Products made from soybeans include: Miso (bean paste), Shoyu (soy sauce), Sufu (Chinese cheese), Ontjom (Oncom), Hamanatto, Idli (with and without soy), Natto, and Tempeh. Address: Human Nutrition Information Service, USDA, Hyattsville, Maryland (and NRRC, Peoria, Illinois).

1314. Hesseltine, Clifford W. 1989. Fermented products. In: Ruth H. Matthews, ed. 1989. Legumes: Chemistry, Technology, and Human Nutrition. New York, NY: Marcel Dekker. x + 389 p. See p. 161-85. [29 ref]

• **Summary:** Contents: Introduction. Miso (bean paste). Shoyu (soy sauce). Sufu (Chinese cheese). Ontjom (oncom). Hamanatto (black beans [fermented black soybeans]). Idli. Natto. Tempeh (tempe).

Contains 3 tables and 9 figures (all flow sheets). Address: Retired, Agricultural Research Service, USDA, Peoria, Illinois.

1315. Maruo, Bunji; Yoshikawa, Hiroshi. eds. 1989. *Bacillus subtilis*: Molecular biology and industrial application. Tokyo: Kodansha; Amsterdam and New York: Elsevier Press. xv + 267 p. Illust. Index. 24 cm. Series: Topics in secondary metabolism 1, [1182 ref]

• **Summary:** The nine chapters in this very interesting book are written by 26 different Japanese contributors. Contents: List of contributors. Preface. 1. Introduction. 2. Taxonomic position of *B. subtilis*. 3. Metabolic and cell growth regulation of *B. subtilis*. 4. Sporulation of *B. subtilis*. 5. Plasmid cloning vectors in *B. subtilis*. 6. Phages of *B. subtilis* and their uses in genetic engineering. 7. DNases involved in restriction and recombination in *B. subtilis* and its relatives. 8. Industrial application of *B. subtilis*: Utilization of soybean as natto, a traditional Japanese food, extracellular enzymes of *B. subtilis*, production of primary metabolites, possible use of *B. subtilis* as a host-vector system for production of biologically active molecules such as hormones and antibiotics, insecticidal proteins from *B. thuringiensis*. 9. Use of *B. subtilis* for re-assay of genotoxic substances.

In the Preface, Maruo observes that a novel method of constructing a genetic map by DNA mediated transformation was established by H. Yoshikawa and N. Sueoka. Thereafter, use of this bacterium in molecular genetics has been increasing rapidly and extending into many fields. "The use of *B. subtilis* has contributed greatly to basic research in genetics, biochemistry, and enzymology. *B. subtilis*, unlike *Escherichia coli*, has the remarkable distinction of becoming competent for DNA uptake and of forming spores, a primitive mode of cell differentiation." Address: 1. Nihon Univ., Tokyo, Japan; 2. Osaka Univ., Osaka, Japan.

1316. Matthews, Ruth H. ed. 1989. Legumes: Chemistry, technology, and human nutrition. New York, NY: Marcel Dekker. x + 389 p. Illust. Index. 24 cm. Series: Food science and technology, No. 32. [150+ ref]

• **Summary:** Contains 10 chapters by various authors. Chapters 4 and 6 are cited separately. 1. Culture and genetics of grain legumes, by Edgar E. Hartwig (for soybeans, see p. 1-5). 2. Harvesting and storage of legumes, by S.S. Kadam, D.H. Salunkhe, and C.Y. Kuo. 3. Refined oils, by Clyde E. Stauffer. 4. Isolated soy proteins, by D.H. Waggle, Fred H. Steinke, and Jerome L. Shen. 5. Legume protein flour and concentrates, by Joseph G. Endres (for soybean protein flour, see p. 140-45; for soybean protein concentrate, see p. 151-53). 6. Fermented products, by Clifford W. Hesseltine. 7. Nutrient composition of raw, cooked, canned, and sprouted legumes, by Jörg Augustin and Barbara P. Klein (for soybeans, see p. 198-203, 208-11). 8. Nutrient content of other legume products, by David B. Haytowitz and Ruth H. Matthews (for soybeans, see p. 219-25, 229-38). 9. Animal feed uses of legumes, by Park W. Waldroup and Keith J. Smith (for soybean meal and whole soybeans, see p. 247-64). 10. Antinutritional factors, by Irvin E. Liener. Dr. Liener notes that plants did not evolve to serve humans or animals. Their main concern is their own survival. Thus, nature has given them the genetic capacity to synthesize toxic substances to help ensure their own survival against predators of all kinds such as insects, fungi, or animals including humans. His Table 1 titled "Distribution of protease inhibitors present in legumes" (p. 341) shows that they are present in most legumes.

Other legumes discussed include peanuts, dry beans, dry peas, lentils, chickpeas, and winged beans. Address: Human Nutrition Information Service, USDA, Hyattsville, Maryland.

1317. Reddy, N.R.; Salunkhe, D.K. 1989. Fermentation. In: D.K. Salunkhe and S.S. Kadam, eds. 1989. CRC Handbook of World Food Legumes: Nutritional Chemistry, Processing Technology, and Utilization. Vol. III. Boca Raton, Florida: CRC Press, Inc. 323 p. See p. 177-217. [233\* ref]

• **Summary:** Contents: Introduction. Soy sauce: Types of soy sauce, preparation of *Shoyu* composition, safety. Miso: Preparation, composition, nutritional quality, miso-like products. Sufu: Preparation, microorganisms, biochemical changes and composition, toxicology, method of preparation, chemical composition, physical properties, nutritional quality. Tempeh: Preparation, nutrient composition, nutritional quality, antinutritional and/or toxic factors, *tempeh* and *tempeh*-like foods from other legumes. Address: 1. Community Research Service, Atwood Research Facilities, Kentucky State Univ., Frankfort, Kentucky; 2. Dep. of Nutrition and Food Sciences, Utah State Univ., Logan, Utah.

1318. *SoyaScan Notes*. 1989. Terms related to soyfoods, soybeans, and the soybean industry: Library of Congress subject headings and call numbers (Overview). Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** Two different types of call numbers are used by American libraries for cataloging their books. Most larger libraries use the Library of Congress call numbers (LC numbers, which start with two letters) and many smaller libraries use the Dewey Decimal System (Dewey numbers, which contain only numbers).

The following are from the Library of Congress Subject Headings (12th ed. 1989) and the Library of Congress Classification Schedules. The first edition of Class S (Agriculture), for example, was published in 1911, and the 4th edition in 1982. BT = Broader terms. NT = Narrower terms. UF = Use for. May Subd Geog = May subdivide geographically, e.g., Soy sauce industry-Japan.

Class H is Social sciences and economics. Class Q is science. Class S is agriculture (SB is plant culture. SB205 is field crops, legumes). Class T is technology (TX includes nutrition). Class Z is bibliography and library science.

HD9000-HD9019 Natural foods industry  
 Shortenings—Use oils and fats, edible.  
 HD9235.S6-.S62 Soybean industry  
 HD9235.S6-.S62 Soyfoods industry  
 HD9235.S6-.S62 Soymilk industry  
 HD9330.S63-.S633 Soy ice cream industry  
 HD9330.S65-.S653 Soy sauce industry  
 HD9330.T68-.T683 Tofu industry  
 HD9490 Soybean oil industry  
 QK495.L52 Soybean botany  
 SB205.S7 Soybean culture (Incl. *Soybean Digest* and Soya Bluebook)  
 SB608.S7 Soybean—Diseases and pests  
 SF99.S Soybean as feed  
 SF99.S Soybean meal as feed  
 TP438.S36 Nattô manufacture  
 TP438.S6 Soy sauce manufacture  
 TP438.S6 Miso manufacture. BT Soybean as food. NT Cookery (Soy sauce or miso)  
 TP684.S Soybean oil  
 TX401.2.S69 Soyfoods nutrition.  
 TX558.S6 Nattô nutrition. BT Fermentation, Soybean as food, Soybean products.  
 TX558.S7 Soyfoods composition. UF Soybean as food.  
 NT Miso, Natto, Tempeh  
 TX558.T39 Tempeh  
 TX558.T57 Tofu  
 Z5074.S73S5 Bibliographies related to soybeans, or all soya in various countries  
 Z5776.S63S5 Bibliographies on soyfoods  
 Z696.1.S68 SOYA (Information retrieval system)  
 The following soy-related terms have a subject heading but no LC call number: Miso industry, Natto industry, Soy

sauce, Soybean flour, Soybean glue, Soybean meal, Soybean milk, Soybean products.

1319. Steinkraus, Keith H. ed. 1989. Industrialization of indigenous fermented foods. New York, NY: Marcel Dekker. xii + 439 p. 24 cm.

• **Summary:** This book contains the following chapters on soyfoods: 1. Industrialization of fermented soy sauce production centering around Japanese shoyu, by Danji Fukushima. 2. Industrialization of Japanese miso fermentation, by Hideo Ebine. It also contains chapters on the industrialization of the production of sake, tapai, African beers, magehu, ogi, and gari. The final chapter is titled “Industrialization of indigenous fermented food processes: Biotechnological aspects.”

The book is dedicated “To the memory of Prof. Andre G. van Veen, a pioneer in the study of indigenous fermented foods.” Address: Inst. of Food Science, Cornell Univ., Geneva, New York.

1320. Ueda, Seinosuke. 1989. Industrial application of *Bacillus subtilis*: Utilization of soybean as natto, a traditional Japanese food. In: Bunji Maruo and Hiroshi Yoshikawa, eds. 1989. *Bacillus subtilis*: Molecular Biology and Industrial Application. Tokyo: Kodansha; Amsterdam and New York: Elsevier Press. xv + 267 p. See p. 143-62. [60 ref]

• **Summary:** Contents: Introduction. *B. subtilis* (*natto*): Conditions for growth of *B. subtilis* (*natto*) (temperature, pH, oxygen, biotin), plasmid of *B. subtilis* (*natto*), bacteriophage of natto. Natto manufacturing process: Introduction, outline of the manufacture of natto, soybeans as raw material, soaking, cooking, inoculation, weighing and packing, fermentation. Biochemical aspects of natto: Change of components of soybeans during natto processing, slime of natto, enzymes of *B. subtilis* (*natto*), flavor of natto, nutritional value of natto, effect of natto as medicine (antibiotics, elimination of [pathogenic] microflora in intestine, anticancer activity, effect on blood pressure, vitamin K content in human milk).

In Japan, natto is sometimes *itohiki natto* to distinguish it from salted, fermented whole soybeans made from steamed soybeans and roasted wheat powder using the koji mold, *Aspergillus oryzae*.

There are various theories concerning the origin of *itohiki natto*, however it is clear that natto was made and sold in Japan during the Edo period (1600-1867—about 400 years ago). It originated in the northern part of Honshu, Japan’s main island. Modern mass production of natto using pure culture *Bacillus subtilis* started in about 1919.

Today in Japan there are about 700 natto factories using about 95,000 tons of soybeans a year. Natto is most often eaten for breakfast in Japan, with boiled rice, often with soy sauce and mustard.

In 1906 the natto bacterium was first named *Bacillus*

*natto* Sawamura by Sawamura; he considered it a new species. In 1974 *Bergey's Manual of Determinative Bacteriology* (8th ed.) included *Bacillus natto* within *Bacillus subtilis*. "However Amaha et al. (1952) and Kida et al. (1956) reported that *B. subtilis* and *B. natto* can be classified separately based on whether biotin is essential for growth." Biotin is essential for the growth of *B. natto*, but not for the growth of *B. subtilis*. Table 8.1.1 lists the "Properties of *Bacillus subtilis* (*natto*)." The optimum temperature for natto growth is about 40°C. Its spores are heat resistant. Address: Dep. of Applied Microbial Technology, Kumamoto Inst. of Technology, Kumamoto-shi, Kumamoto 860, Japan.

1321. *Nikkei Ryutsu* (Japan), 1990. Nattô shinpojiumu o hiraku, Shibata Toshihiko-shi (45). Seikatsu-sha no tachiba de gendai shakai minaosu. Shôhi-sha jôhô [Mr. Toshihiko Shibata (45) will open the Nattô Symposium: Rethink the modern world from the consumer's point of view. Consumer information]. Jan. 6. [Jap]

1322. Smith, Keith J. 1990. American Soybean Association: Recent developments (Interview). *SoyaScan Notes*. Feb. 14. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Dr. Kenneth Bader became ASA's chief executive on 1 Oct. 1976. He worked in Hudson, Iowa, for about 2 years, then he supervised ASA's move to St. Louis from Hudson, Iowa, in Dec. 1978.

ASA now has a research references program. From a database search via Washington University, they obtain and supply to certain researchers and coworkers about 200-250 research references every 3 months, mostly on soybean production.

ASA presently uses these following four terms interchangeably: soybean oil, soy oil, soya oil, and soyoil. Smith thinks that "soy oil" will eventually become the standard; the term "bean" is a negative when used with foods. However "soybean meal" will probably be used in preference to soymeal, primarily because there are soybean meal standards used by the feed trade and NSPA. However, if they eventually propose soybean meal with higher protein content they may call it "soymeal," to distinguish it from 44% meal, since protein is where they have the real advantage.

Concerning component pricing, Smith has spent about a third of his time on this subject during the past year. It is very frustrating. ASA encourages and funds soybean breeders to increase protein and oil levels, and it is almost certain that breeders will be paying increased attention to composition. But whether farmers will ever be officially paid on the basis of protein and oil is highly questionable. Many farmers in the north and northwest will be discounted on the basis of composition today, so they are really being paid on the basis of average component pricing. Smith anticipates that nothing will be done to change soybean trading and marketing

rules, but there will be continued pressure on soybean breeders to at least consider composition as they release new varieties. Foreign matter is a major problem in the export markets. USDA's Federal Grain Inspection Service (FGIS) has proposed changing foreign matter requirements over the last several years but U.S. exporters and crushers have effectively opposed this (as well as blending of soybeans), and also oppose component pricing. The Japanese indicate that they are going to start purchasing based on component pricing; this may be a force accelerating pricing. FGIS only has to give information on oil and protein levels if the exporter requests it. In the original proposed ruling it was supposed to go from optional to mandatory in 1991, but the latter provision was deleted. ASA has repeatedly supported component pricing, so that soybeans are traded on their inherent quality characteristics, which is their true value. U.S. soybean crushers go out in early fall and analyze the composition of soybeans from counties in many geographical areas. They buy based on this data, and therefore are already doing a form of component pricing, on the average rather than by the individual load. They may not feel it is worth the extra price of getting the data on each load.

There is a lot of interest in value-added products in Washington, DC, nowadays. But ASA's main market is for soybean meal that becomes meat, milk, and eggs. Every state now has a program on breeding specialty soybeans (as for natto or tofu), and most are very optimistic that the program will benefit their state, but the market will soon get saturated. ASA promotes niche markets and encourages breeders to breed soybeans for those markets. The future of low-lipoxygenase soybeans looks good. The main reason ASA has not done much with the soyfoods market is because it is so small. ASA will support the use of soy proteins as meat extenders (a niche market) as long as the red meat industry doesn't complain too much. In the future, this market could be much more important.

A number of state soybean associations such as Minnesota, North Carolina, South Dakota, and Illinois are promoting soyfoods such as soy ice cream and soynuts within the state in order to get growers involved and increase membership. They have found that in order to sell memberships and develop leadership, farmers have to do something. Farmers like to dip ice cream. ASA is supportive of anything that will increase membership and leadership in the states.

Concerning areas of potential cooperation between ASA and the U.S. soyfoods industry / association, ASA is concerned about the perception of soyfoods and would be interested in cooperating in any way possible to give soyfoods a more positive image, and to put them in the mainstream of consumer attitudes and foods. Talk to Gunnar Lynum, who is in domestic promotion.

ASA probably could put together graphs of membership and funding. He suggests that Soyfoods Center write a letter

to Ken Bader, Steve Drake, and Marlyn Jorgensen (ASA President) offering to work with ASA in developing a history of ASA. ASA has a history of ASA that was partially done (by Kent Pellett) while they were still in Hudson. It has been dormant for the past 10 years. It is a low priority and will probably never be published, unless I volunteer to write it.

The next World Soybean Research Conference (WSRC) will probably be held in China (PRC), or Brazil (less likely). In recent years there has been a decrease in the number of people working on soybean utilization. So there is not much new to report at the world conferences. The people on the WSRC continuing committee are mostly soybean production people and breeders. Maybe the soyfoods industry and ASA (Gunnar Lylum, who is mainly into soy oil and industrial uses) could cooperative to have the soyfoods industry better represented in these conference speeches.

ASA will put Soyfoods Center on its news release list. Address: Staff Vice President, Research and Utilization, American Soybean Assoc., P.O. Box 27300, St. Louis, Missouri 63141. Phone: 314-432-1600.

1323. Hesselstine, C.W. 1990. Margaret B. Church, 1889-1976. *Mycologia* 82(1):144-47. Jan/Feb. [20 ref]

• **Summary:** “Dr. Margaret Brooks Church was a distinguished mycologist and a charter member of the Mycological Society who has been neglected in the history of mycology. She made several noteworthy contributions to systematic and applied mycology. She, along with Dr. Charles Thom, wrote the first manual on the genus *Aspergillus*. The first authoritative treatment of oriental fermented foods in the West was written by her. It remains an accurate account of these fermentation processes. Dr. Church also conducted laboratory experiments on soy fermentations and collaborated with Japanese workers, especially Professor K. Oshima; Hokkaido Imperial University, Sapporo, Japan...

“Dr. Church was born in Providence, Rhode Island, on March 13, 1899. She received an A.B. in 1912, an A.M. in 1914, and a Ph.D. in 1918, all from Brown University.

“One of her most important contributions was the USDA Department Bulletin 1152 entitled, ‘Soy and Related Fermentations,’ published in 1923. At that time there was interest in establishing soybean production in the United States because soybeans were being imported into the U.S. from the Orient. This publication had many photographs of the industrial processes of making koji and soy sauce in Japan. Research in soy sauce production began in 1918 and continued for several years. Soy sauce, miso, molded [fermented] tofu, and natto were also described...

“Dr. Church’s research dealt extensively with koji, and it is surprising that she knew even then that tane koji (koji inoculum) consisted of several selected mold strains of *Aspergillus oryzae*. The fact that yellow-green *Aspergillus* strains were employed in these fermentations undoubtedly led both Thom and Church to publish the taxonomic

relationships of this group of molds in 1921. Her research on koji was a likely catalyst for her study of industrial enzymes...

“In 1938-1939, Dr. Church served as an indexer and abstractor for Biological Abstracts. Upon her retirement, presumably in 1939, she moved to Lyndon, Vermont.” A large photo shows Dr. Church. Address: 5407 Isabell, Peoria, Illinois 61614.

1324. Ontario Soybean Growers’ Marketing Board. 1990. A profile of the Canadian soyfoods market—Characteristics and potential. Box 1199, Chatham, ONT N7M 5L8, Canada. vi + 40 p. March. 28 cm. Spiral bound.

• **Summary:** Contents: 1. Introduction: Background, study objectives. 2. Research procedures: Data limitations, data collection (data sources). 3. The soyfood market: Soyfood production and utilization, domestic production, imports and exports (introduction, whole soybeans, soy flours and meals, soy oil, soy sauce, protein substances, cream and other substances, bran & soy hulls, soy meal oil cake), balance, conclusions regarding opportunities.

4. Soybeans for food purposes: Natto beans (background, market characteristics, market potential), whole bean soyfoods (introduction, soynuts, full fatted soy flours, soymilk, tofu, soy sprouts, tempeh, miso, natto, soy sauce), foods from soy ingredients (introduction, defatted soy flakes, soy protein concentrate, soy protein isolates, textured soy protein, consumption and imports). 5. Organic soyfoods: Introduction, organizations (major players, labelling requirements, certification), organic soybeans, organic soyfoods, market opportunities, recommendations.

6. Market estimates: Introduction, conversion rates, market characteristics (introduction, ethnic characteristics, immigration trends, implications), soyfood consumption (production). 7. Soyfood products: Introduction, new products (whole bean products, products from soy components), existing products (products with potential for growth). 8. Marketing strategy: Introduction, respondent requests (background), market opportunities (traditional soyfoods, new products), systems development (system information needs, human resources, production research), institutional needs.

This study was commissioned by the Ontario Soybean Growers’ Marketing Board to provide a description of the Ontario soyfood industry. “Production and utilization: In the 1988 crop year, approximately 1.12 million tonnes of soybeans were produced on 1.28 million acres in Ontario. Approximately 86% of the soybeans were sold through the Board, with the remainder being fed or retained on the farms where they were grown. In 1988, 860 thousand tonnes of soybeans were crushed in Canada to produce soybean meal and soy oil, and 272 thousand tonnes were exported.

“Imports and Exports: Canada had a negative balance, a deficit, of almost \$190 million in the value of soybeans and

soy products traded. This is just over half a million dollars per day. Our largest single area of exports is whole soybeans for human foods. The percentage of these beans going to the major markets in 1988 were: USA, 37%; Pacific Rim Countries, 34%; and Europe and other 29%. Our greatest imbalance in exports and imports is in soybean meal or oil cake. Canadian crushers are unable to maximize their sales of oil cake because of difficulties in selling surplus soybean oil in the US. Soy oil being sold into the US presently faces a tariff of 18% which is decreasing at the rate of 2.25% per year as per the Canada United States Trade Agreement...

“Institutional development: We suggest the Board initiate the establishment of a Soyfood Development Association similar in structure and function to the Canola Council of Canada... There is a need to begin to bring all industry stakeholders together to systematically identify problems, information and research needs; develop data bases; and cooperatively promote the soyfood industry.”

Soybeans for food purposes: The total volume of soybeans consumed as soyfoods in Vancouver (BC), Toronto (Ontario), and Montreal (Quebec) was estimated at about 6,000 tonnes, and imports were estimated to be equivalent to 8,000 tonnes of soyfoods.

Miso: One large Vancouver producer and one Toronto producer estimated that the volume of soybeans used to make miso in Canada is only about 35 tonnes/year.

Modern Soy Protein Products: Soy flour, concentrates, isolates, and textured soy protein products. Roughly 2,400 tonnes of soybeans are used in Canada for the production of these products, and 5,600 tonnes of soybeans are used to make the imported products (only bakery flour and extruded flour are made in Canada). Almost 1,000 tonnes of soy protein concentrates and isolates, and 400 texture soy proteins were imported, 83% from the USA. Total exports were 800 tonnes, of which 578 tonnes went to the USA. Soy flour (full-fat): The term “flour” generally signifies that the material has been ground finely enough to pass through a 100-mesh screen. Only relatively small volumes of full-fat soy flours are used directly as human foods. Some are used in bread, crackers, and pastry products. 5 companies in Canada make 1,538 tonnes of soy flour worth \$495,000.

Natto: Canadians sell roughly 8 to 10 thousand tonnes of natto beans in Japan each year. Natto-type beans are “created by screening out the small beans from among regular food grade soybeans which have white hilums” (p. 15). In Japan about 100,000 tons/year of soybeans are used to make natto. Recently, Canada (via 3 companies—First Line Seeds, W.G. Thompson, and King Grain) has supplied about 10% of this market. Ontario produces about 8,000 to 10,000 tonnes of natto beans. Competition is expected to increase from U.S. seed breeders.

Soymilk: There are presently no large Canadian soymilk manufacturers. A plant is being built by an international trading company near Vancouver (YHS Pacific Fruit

Concentrates Ltd., owned by Yeo Hiap Seng). It will supply both the local market and the Western U.S. market when it goes on stream later this year. A high proportion of imported soymilk is organic. Two brands account for 3/4 of all imports: Edensoy and Vitasoy. A high proportion of all soymilk imports are certified organic. This emphasis makes it difficult for Canadian producers to compete because of the shortage of organic soybeans in Canada. Consumption of soymilk is increasing at about 10% a year. Prices range from \$1.50 to \$2.75 per liter, with the organic product commanding the higher prices. Just under 100 tonnes of soybeans are used to produce soymilk in Canada: Vancouver 42 tonnes, Toronto 30 tonnes, Montreal 25 tonnes, plus imports 240 tonnes. 1 kg of soybeans produces 16.5 kg of soymilk.

Soynuts: The volume of soynuts made in Canada is quite small. One Toronto company [Grove Country Foods Canada, Inc.; they were in business 1-2 years, but were out of business by Jan. 1991], which began operation in Nov. 1988, sells a line of roasted nuts, which are roasted in the USA and chocolate-dipped in Ontario. Production was only a few tonnes in 1989 and is estimated to be about 10 tonnes in 1990.

Soy sauce: In 1986, according to Statistics Canada data, 2,503 tonnes of soy sauce were produced by 6 firms. The value was \$2,161 per tonne for a total of \$5,411,000. In 1988 Canada imported 5,680 tonnes of soy sauce valued at \$4 million, primarily from China, the United States, Hong Kong, and Japan. Exports were 58 tonnes valued at \$65,000. The major Canadian producers are China Lily and Sun Fresh in Toronto, Wong Wing and VH in Montreal, and Golden Dragon in Vancouver. The value of Toronto production is currently estimated to be about \$5 million.

Soy sprouts: One Toronto manufacturer uses 20-25 tonnes of soybeans per year.

Tofu: About 3,300 tonnes of soybeans are used to produce tofu in Canada, more than any other soyfood. The volume of soybeans used is estimated at 1,400 tonnes in Toronto, 1,200 tonnes in Quebec (when a relatively large operation in Hull [La Soyarie, Inc.], near Ottawa, which exports to Ontario is included), 625-700 tonnes in Vancouver, and 125 tonnes for imported tofu. 1 kg of soybeans produces 2.4 kg of tofu.

Tempeh: Only about 33 tonnes of soybeans are used to make tempeh in Canada, and an estimated 15-20 tonnes in Ontario. Imports are relatively small. 1 kg of soybeans produces 1.6 kg of tempeh. Very few firms produce tempeh in Canada. One producer claims to have over half the Ontario market. A major distributor suggested they sold 4-5 times as much tofu as tempeh.

Soybean crushing: Since 1986 the number of firms crushing soybeans and producing soy oil has decreased from 3 to 2 [Central Soya owns two plants; in 1990 they bought the Canadian Vegetable Oil Processing (CVOP) plant in

Hamilton, Ontario, formerly owned by Canada Packers Inc. They purchased Victory Soya Mills in Toronto in early 1985. So now 2 firms own 3 plants]. In 1986 the three plants made 95,108 tonnes of crude soy oil worth \$57,271,000. Two firms made deodorized soy oil, but the volume and value were confidential. Less than \$2 million of any type of soy oil is imported.

Consumption of soyfoods in Canada is strongly linked to Asian-Canadians. A table (p. 32) shows that according to the 1986 census, there were about 444,000 people of East- and Southeast Asian origin living in three major Canadian cities: Vancouver (155,105 people comprised 11.2% of the city's population), Toronto (234,325 people comprised 6.8%), and Montreal (55,585 people comprised 2.4%). Thus Toronto was by far the largest market, but Vancouver had the highest density of Asian-Canadians. A similar table (p. 33) updates the previous table to 1988. Immigration has increased sharply since then.

Note: This is the earliest document seen (Feb. 2002) that uses the term “food grade” (or “food-grade”) in connection with Canadian soybeans (see p. 15). Address: Chatham, ONT, Canada.

1325. *Hasshô no chi: Nattô Shinpojiumu in Akita. Nattô was sekai o sukuu!!* [The birth place: Natto symposium in Akita. Natto can save the world!!]. 1990. Akita, Japan: Akita-ken Natto Kogyo Kyodo Kumiai. 5 p. [Jap]  
 • **Summary:** On 21-22 April 1990 a natto symposium was held in Akita, a seaport and the capital city of Akita Prefecture in the Tohoku region of Japan (northeastern Japan). It is located on the Japan sea. Specifically, it was held in the Akita-ken Sôgô Saikatsu Bunka Kaikan (a cultural hall).

1326. *Akita Sakigake (Akita Pioneer, Japan)*.1990. Nattô de sekai “seiha” o. Inoki-shi ra netsuppoku kataru. Akita-shi de shinpo [Natto conquers the world. Mr. Antonio Inoki and others talked enthusiastically. Symposium (held) in Akita city]. April 22. p. 3. [Jap]  
 • **Summary:** A photo shows four men seated behind a table with the word “Natto Symposium” written in Japanese characters on a banner behind them.

1327. *Mainichi Shinbun (Akita Edition, Japan)*.1990. Kôen, ryôri de oishisa jikkan. Akita Atrion, Nattô Shinpo ni 500 nin [Both the lectures and the sampling of foods were delicious. At the Akita Atrion, there were 500 people at the Natto Symposium]. April 22. p. 24. [Jap]  
 • **Summary:** The symposium was held in a building named the Akita Atrion. A photo shows several ladies looking at trays of natto dishes on a table.

1328. *Mainichi Shinbun (National Edition, Japan)*.1990. Zakki-chô [Miscellaneous notes]. April 22. p. 27. [Jap]

• **Summary:** About the Natto Symposium held in Akita prefecture. A small photo shows a man standing behind a microphone at a podium with the word “Symposium” written in Japanese katakana on a banner behind him.

1329. *Yomiuri Shinbun (Akita, Japan)*.1990. Nattô hasshô no chi [The birthplace of natto]. April 22. p. 22. [Jap]  
 • **Summary:** A natto symposium was held in Akita city, Japan.

1330. *Yomiuri Shinbun (Akita, Japan)*.1990. Nattô no kokusai-sei kyôchô. Akita de shinpojiumu [The international aspects of natto were emphasized: Symposium in Akita]. April 22. p. 25. [Jap]  
 • **Summary:** A natto symposium was held in Akita city, Japan.

1331. *Yomiuri Shinbun (Japan)*.1990. Nattô Shinpo: Kakuchi kara 400 nin tsudoï, nekki. Shokuryô kiki ni tokkôyaku. Seijinbyô e no kôyô mo toku [Nattô Symposium: 400 people gathered from various places, excited and enthusiastic. An effective medicine for the world hunger. They talked about its good effects on adult diseases]. April 22. p. 23. [Jap]  
 • **Summary:** A natto symposium was held in Akita city, Japan.

1332. *Shukan Asahi (Japan)*.1990. Nattô wa sekai o sukuu [“Natto saves the world”]. April 27. p. 16. [Jap]  
 • **Summary:** Contains four frames of cartoons. A natto symposium was held in Akita city, Japan.

1333. *Asahi Shinbun (Evening Ed., Japan)*.1990. Sekai ni itohiku? “Nattowaaku.” Nattô fan-ra ga kokusai taikai keikaku, 11 gatsu [Natto-work (natto network) stretches and connects its strings to the world. Natto fans are planning to have an international gathering (symposium) in November]. May 2. [Jap]

1334. *Toyo Shinpo (Soyfoods News)*.1990. 89 nen shinkoku shotoku rankingu [1989 ranking of tofu, natto, and konnyaku companies in Japan, based on reported income to the tax bureau]. May 21. p. 1. [Jap]

• **Summary:** Rank–Company name (Food type)–Prefecture–Reported income in million yen, ranking among all Japanese industries. For food types: T = Tofu, DFT = Dried-frozen Tofu, A = Aburagé (deep-fried tofu pouches), N = Natto, K = Konnyaku:

1. Asahimatsu Shokuhin (DFT, A)–Nagano–843–5,504
2. Takano Foods (N)–Tochigi–445–10,464
3. Asahi Kôgyô (T + other foods)–Tokyo–444–10,490
4. San Shokuhin (T)–Kagoshima–417–11,204
5. Okay Shokuhin Kôgyô (A)–Fukuoka–362–12,867
6. Tajimaya Shokuhin (T, N, A)–Hyôgo–322–14,419
7. Azuma Shokuhin (T)–Tochigi–320–14,516

8. Misuzu Tôfu (DFT, A)–Nagano–307–15,128
9. Fujita Shokuhin (T)–Hyôgo–243–19,082
10. Sekigoe Bussan (K)–Tokyo–189–24,470
11. Tochigi-ken Natto Seisan (N)–Tochigi–174–26,477
12. Santeiri (T)–Aichi–140–32,840
13. Sankô Shokuhin (T, Cow's milk)–  
Yamagata–136–33,679
14. Saga Tôfu Morika (T)–Kyoto–121–37,484
15. Tengu (T, N, A)–Ibaraki–119–38,342
16. Fuji Kiyô Konnyaku (K)–Kyôto–113–40,160
17. Nihon Tanpaku Kôgyô (T, A)–Tokyo–110–41,156
18. Yashima Shokuhin (T, A)–Kanagawa–107–42,410
19. Yama Shoku (T)–Nara–95–47,272
20. Nagai Sôgo Shokuhin (T, A)–Hyôgo–83–53,659
21. Asahiya Shokuhin (T)–Kanagawa–78–56,956
22. Tsujikane Shokuhin Kôgyô (K, A)–Gifu–77–57,789
23. Marukawa Shokuhin (T)–Hokkaidô–76–58,061
24. Kyôto Tanpaku (T)–Kyôto–71–61,805
25. Niihama Seitô (T)–Ehime–58–73,954
26. Kakumitsu Kudô Shokuhin (T)–Aomori–55–78,339
27. Matsuyama Tanpaku (T)–Ehime–50–84,444
28. Tôkô Shokuhin (T, N)–Tokyo–46–91,698
29. Tokyo Minato (T)–Ibaraki–41–99,618
30. Ebara Shokuhin (T)–Tokyo–40–101,982

Explanation: Number 1, Asahimatsu Shokuhin, makes dried-frozen tofu and aburagê. In 1989 the company reported its income to be 843 million yen. It was the 5,504th largest company in Japan. Note: A number of large manufacturers of dried-frozen tofu, perhaps because of slow sales, are now diversifying into deep-fried tofu pouches.

1335. *Spa! (Japan)*. 1990. Tsuini “Sekai Nattô taikai” kaisai e! Nattô wa sekai o sukuu ka!? Kessen ni kiku, boke ni, kôketsuatu ni, gan-ni [Zoom up: Finally the opening of the “International Nattô Symposium”! Can nattô save the world? It helps to prevent coronary thrombosis, senility, high blood pressure, and cancer...]. May 23. p. 20-21. [Jap]

• **Summary:** Photos show: (1) A person holding chopsticks lifting nattô, connected by many strings, up from atop a bowl of rice. (2) A pile of about 15-20 different nattô packages.

1336. Macfarlane, Bruce J.; Riet, W.B. van der; Bothwell, T.H.; et al. 1990. Effect of traditional oriental soy products on iron absorption. *American J. of Clinical Nutrition* 51(5):873-80. May. [28 ref]

• **Summary:** Various soy products (silken tofu, tofu, tempeh, nattô, different types of miso, sufu, and soy flour) were fed to 242 women. Blood levels of iron were then compared. Silken tofu, tempeh, nattô, and the misos showed better iron absorption than tofu and sufu. The authors speculated that because tofu is higher in calcium, it might be this calcium that is inhibiting iron absorption. Silken tofu, coagulated with GDL, has a much lower calcium content than silken tofu. Address: MRC Iron and Red Cell Metabolism Unit,

Dep. of Medicine, Univ. of Witwatersrand, Johannesburg; Div. of Food Science and Technology, CSIR, Pretoria; and the Dep. of Medicine, Univ. of Natal, Durban, South Africa.

1337. Esaki, Hideo.; Nohara, Y.; Onozaki, H.; Osawa, T. 1990. [Antioxidative activity of nattô]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 37(6):474-77. (Chem. Abst. 114:22641). [Jap]\*

1338. Miller, Bryan. 1990. Restaurants:... Sushisay, basic and raw. *New York Times*. July 6. p. C18.

• **Summary:** This is a review of the Japanese restaurant Sushisay (38 East 51st St.), the only American outlet of a 26-restaurant chain in Japan. It specializes in raw and marinated seafood. One of the few cooked items, an appetizer, “is grilled squid legs. Bite-size pieces of crispy squid dipped in soy sauce are as addictive as popcorn.” Another of its starters is “maguro nattô, tuna in fermented soy beans, which had a texture and highly fermented flavor that was off-putting to some tastes.” A soup the reviewer liked was “asari wan, a light miso broth with little-neck clams in the shell...”

1339. *Healthy Talk (Japanese Monthly Magazine)*. 1990. Nattô wa ningen to chikyû o sukuu! Nattô Shinpojiumu [I love nattô. Natto can save human beings and the Earth: Natto symposium]. July. No. 58. p. 17-20. Cover story. [Jap]

• **Summary:** Coverage of the Second Asian Symposium on Non-Salted Soybean Fermentation held 13-15 Feb. 1990 in Jakarta, Indonesia.

Photos show: (1-2) Speakers on the platform, with the name of each written in large characters on white paper attached to the front of each table. (3) Natto being sold in a retail store in Japan. (4) A bowl of rice topped with nattô. (5-8) prepared nattô dishes; the name of each is given. (9) A person standing behind a podium.

A cartoon character of a stylized globe, with longitude



and latitude lines, eyes, nose, and mouth, eating nattô from a bowl, appears several times. Note: This magazine is published and printed by Tokyo Fuji Seihan Printing Co., Ltd.

1340. Ontario Ministry of Agriculture and Food. 1990.



Soybean buyers mission from new markets, July 1-7, 1990. Tokyo, Japan: Ontario Ministry of Agriculture and Food. 61 p. 30 cm. Saddle stitched. [Eng]

• **Summary:** This conference took place in Ontario, Canada. On the mission were two buyers each from Indonesia (P.T. Indofood Interna Corp., BULOG), Philippines (Universal Robina Corp., Paritas Trading Corp.), and Taiwan (Sun Ford Mfg. Corp, Great Wall Enterprise Co.). Michael Loh of OMAF/Tokyo was the mission leader. Contents: Background and purpose. Mission members. Itinerary. Seminar agenda. Canada's soybean industry, by Fred Brandenburg of OSGMB. An overview of export opportunities in the new markets (Korea, Taiwan, Philippines, Indonesia), by Michael Loh of OMAF, Tokyo. Role of Taiwan Soybean Importers, by Laurence Hsiao of Sun Ford Conglomerate Corp. Soybean market in Indonesia, by A. Saifullah of BULOG, Indonesia. The market prospective for tempeh in the year 2000, by Ms. Susani K. Karta, manager, P.T. Indofood Interna Corp. (Indonesia). Appendix: 1. Ontario soybean suppliers (directory of 15 exporters). 2. Useful contacts. 3. Ontario soybean oil crushers (ADM, Victory Soya Mills, Central Soya of Canada). 4. Role of the Ontario Soybean Growers' Marketing Board. 5. Development of soybean varieties (incl. Harovinton for tofu; Canatto, Nattawa, and Nattosan for natto). 6. Market trends in the development of traditional soyfood, by Susani K. Karta (ASA, Singapore; Originally presented at the ASEAN Food Conference, Oct. 1988, Bangkok, Thailand). 7. Reference materials for doing business in Asia/Pacific.

"Natto soybean variety development at Agriculture Canada in Ottawa has also received considerable support from the OSGMB. Ottawa's Dr. Harvey Voldeng has been extremely successful at breeding Canada's top natto varieties (Canatto, Nattawa, and Nattosan) as well as incorporating higher protein levels into other early maturing varieties."

"Soybean breeders are selecting for high protein and white hilum whenever possible" (p. 40). Address: Tokyo, Japan.

1341. Sugawara, Etsuko; Ito, T.; Yonekura, Y.; Sakurai, Y.; Odagiri, S. 1990. [Effect of amino acids on microbiological pyrazine formation by *B. Natto* in a chemically defined liquid medium]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 37(7):520-23. [9 ref. Jap; eng]\*

Address: Dep. of Agricultural Chemistry, Iwate Univ., Ueda, Morioka 020, Japan.

1342. *Asahi Shinbun Weekly Magazine*. 1990. "Chikyû ni yasashii" o ure: Kankyô-shoku Nattô ga shinrin o sukuu [Sell "Kind to the Earth": Eco-friendly food, natto saves forests]. Aug. 21. p. 6. [Jap]

• **Summary:** A large photo shows a New York chef who cooks with natto.

1343. GEM Cultures. 1990. Catalog [Mail order]. 30301 Sherwood Rd., Fort Bragg, CA 95437. 9 p. Aug. [4 ref]

• **Summary:** This catalog celebrates the company's tenth anniversary. Contents: 1. Powdered cultures for soycrafters: Powdered tempeh starter, PTS (11 gm [\$2.25, makes 5+ lb of tempeh], 35 gm, 500 gm, 1000 gm). Starter cultures for miso, amazake, shoyu, and tamari. Introductory koji kits. Commercial spore packets for miso or shoyu. Powdered natto starter. Rice koji (cultured rice) for light misos, amazake, pickles. Most in home or commercial sizes. 2. Cookbooks with culture (lists 4 books). 3. Natural salts for curding tofu: Natural nigari or Terra Alba calcium sulfate in 1 lb or 5 lb bags. 3. Self renewing cultures: Fresh viili culture, fresh kefir curds, fresh sourdough culture, seed miso. 4. Sea vegetables from the Mendocino Sea Vegetable Co. 5. Handy reusable items: Super sealers (lids for canning), cheesecloth (grade 60), gauze drawstring bags (for spices in mulled cider, whole herbs, etc.). Address: Fort Bragg, California. Phone: 707-964-2922.

1344. Torii, Yasuko. 1990. [Re: New developments with tempeh and natto in Japan]. Letters to William Shurtleff at Soyfoods Center, Sept. 2 and 23. 2 p. Handwritten and typed, with signature. [Jap; eng+]

• **Summary:** In Japan, tempeh has not become popular. Marusan-Ai has stopped making tempeh. What a shame that Mr. Kanasugi, who was so enthusiastic about tempeh, has just passed away. The Tempeh Study Group (Kenkyukai) is still meeting 2-3 times a year and trying to popularize tempeh.

On the other hand, natto is becoming very popular and production is increasing rapidly. Natto groups are sponsoring various events to help popularize natto outside Japan.

Mrs. Torii traveled to Budapest, Hungary in early September to attend an IFOAM Conference on organic farming, which is spreading in Eastern Europe. There she enjoyed tasty chilled tofu (*Hiya-yakko*) and met a person who knows a lot about tofu. At an international agricultural fair, she found that soyfoods were becoming popular. The booths offering roasted soybean snacks and soya burgers were crowded. She saw an attractive soy cookbook containing color photos, and met a man who is translating *The Book of Tofu* into Hungarian. The Kombinat was doing a lot to develop and popularize soyfoods.

In Feb. she went to Indonesia with other members of the Tempeh Study Group to attend a symposium on soybean fermentation. It was very interesting. Address: Kamitsuchidana 324, Ayase-shi, Kanagawa-ken 252, Japan. Phone: 0467-76-0811.

1345. *Vegeta (Japanese Monthly Magazine)*. 1990. Nattô toraianguru: Tenpe was Indonesia no dentôshoku desu [The natto triangle: Tempeh is a traditional food of Indonesia].

Oct. p. 30-32. [Jap]

• **Summary:** A map shows the “natto triangle” in east and southeast Asia. Fifteen photos show various aspects of tempeh in Indonesia, including the finished product wrapped in banana leaves, tempeh being sold by a woman in a traditional market, six steps in the production of tempeh, and six views of cooking with tempeh.

1346. Aderibigbe, Esther Y.; Odunfa, S.A. 1990. Growth and extracellular enzyme production by strains of *Bacillus* species isolated from fermenting African locust bean. *J. of Applied Bacteriology* 69(5):662-71. Nov. [43 ref]

• **Summary:** Iru, also known as dawadawa in the Hausa language, is made by fermenting the African locust bean, seeds of *Parkia biglobosa*. It is consumed as a soup flavoring condiment in many West and Central African countries, and serves as a source of protein for poor rural families.

Researchers have made progress in optimizing production of iru, and have found that only *Bacillus subtilis* strains bring about the most desirable fermentation. These strains were found to be better than *B. natto*, a strain of *B. subtilis* isolated from natto, a fermented Japanese soybean product. Address: Dep. of Botany and Microbiology, Univ. of Ibadan, Ibadan, Nigeria.

1347. Akimoto, Takashi; Yamada, Susumu.; Matsumoto, Isao. 1990. [Relation between protease and gamma-glutamyltranspeptidase activities and qualities of natto]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 37(11):872-77. [Jap]\*

1348. Sanger, David E. 1990. A Japanese innovation: The space antihero. *New York Times*. Dec. 8. p. 1.

• **Summary:** Mr. Toyohiro Akiyama, age 48, a Japanese television reporter and the first Japanese (and the first journalist) in space, is now on board the Russian space station Mir. Tokyo Broadcasting System, seeking a large boost in ratings, is reported to have paid the Soviet Union \$12 million to have him taken on board—after 18 months of rigorous training with Soviet astronauts. A chain smoker who has admitted having withdrawal problems, Mr. Akiyama mused at dinnertime “I wish I had brought along some natto,” the smelly fermented soybeans that even many Japanese say they cannot bring themselves to swallow.” A photo shows Akiyama as his spacecraft docked with Mir. Address: Tokyo.

1349. Taira, Harue. 1990. Quality of soybeans for processed foods in Japan. *JARQ (Japan Agricultural Research Quarterly)* 24(3):224-30. Dec. [7 ref. Eng]

• **Summary:** Contents: Abstract. Introduction. Quality for food processing: Tofu, miso, natto. Variation of bean quality and suitability for processing. Factors inducing variations in

the chemical composition and suitabilities for processing.

Figures show: (1) Consumption of soybeans in Japan in 1988 (1,000 tonnes): Total: 4,663 tonnes. Oil and meal 77%. Food 19%. Other 4%. Food products: 886 tonnes. Tofu and abura-age 57%. Kori-tofu 3%. Miso 20%. Natto: 11%. Other 9%. Individual food products (\* An additional 69,000 tonnes are consumed in the form of cooked whole soybeans, yuba, kinako, moyashi {sprouts}, and others). Tofu and abura-age 505 tonnes. IOM and other USA 83%. Japan 11%. China 6%. Kori-tofu 29 tonnes. IOM and other USA 72%. China 28%. Natto 100 tonnes. China 50%. USA and Canada 30%. Japan 20%. Miso 179 tonnes. China 86%. Japan 11%. IOM 3%. Soy sauce: Defatted soybean flakes 183 tonnes (97%) and whole soybeans 5 tonnes (3%).

(2) Frequency distribution of solid matter extractability in soybean milk (105 samples; 60 cultivars and 7 lines)—for varieties Enrei, Fukuyutaka, Akishirome, Akiyoshi, Tamahomare, Fujimijiro, Hyuuga, Shirosenari. Average value of U.S. soybeans. Mode: 79%. Range 70-82%.

(3) Correlation between protein and sucrose content in soybeans. Inversely correlated. The more protein, the less sucrose. (4) Correlation between hardness of steamed seeds and ammonia nitrogen content in natto. Directly correlated. The harder the steamed seeds, the more ammonia nitrogen in the finished natto.

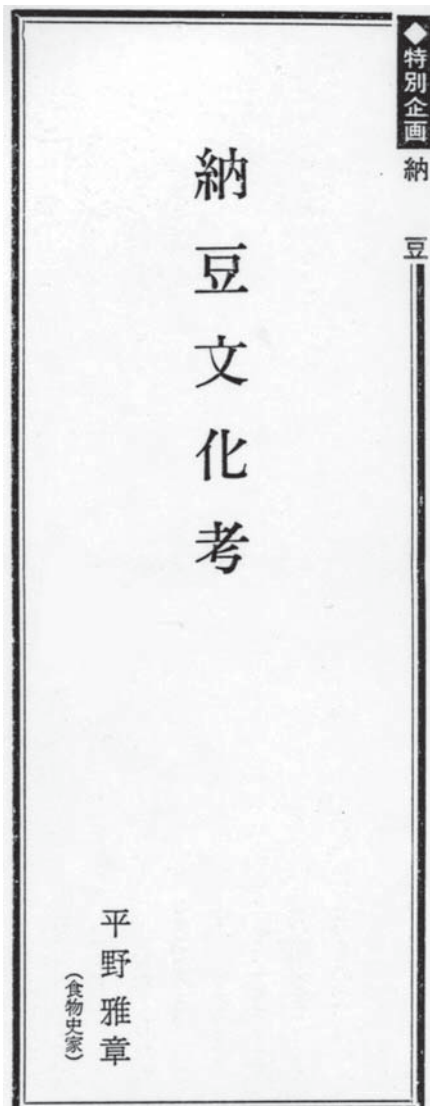
(5) Variation in chemical composition and suitabilities of soybeans for processing: Raw soybeans for processing, soybean milk for tofu, steamed seeds for miso, natto, cooked soybeans.

Tables: (1) Relationship between soybeans and processed foods in raw soybeans, soybean milk, and steamed seeds. (2) Chemical composition and suitability of soybeans from USA, China, and Japan for processing into tofu, miso, natto, cooked soybeans. Varieties: Enrei, Fukuyutaka, IOM (USA; low protein, high oil), Tamahomare, Kitamusume, Miyagishirome (large seeded), Nattoshoryu (small seeded), Chinese (low protein, high carbohydrate). Address: Dep. of Utilization, National Food Research Inst., Ministry of Agriculture & Forestry, Koto-ku, Tokyo.

1350. *Artery*. 1990. Warfarin antagonism by natto and increase in serum vitamin K by intake of natto. 17:189-201. \*

1351. Hirano, Masaaki. 1990. Nattô bunka-kô [Thoughts on the culture and history of natto]. *Shoku no Kagaku (Food Science Journal)* No. 144. p. 16-22. [2 ref. Jap]

• **Summary:** The author believes that natto (*itohiki nattô*) was first mentioned in the *Shôjin Gyorui Monogatari*, which according to tradition was written by Yoshimoto NIJO (lived 1320-1388) in the mid-Muromachi period. The Muromachi period lasted from 1338 to about 1573, so the middle of it would have been in about 1455, or 67 years after Mr. NIJO died.



Page 22 shows two annotated illustrations from the book titled *Jinrin Kinmôzui* published in 1690 in Kyoto. The top illustration shows a man selling natto in Edo (today's Tokyo). The bottom one shows a man selling tatakhi-natto in Kyoto. Address: Japanese food historian, Nikenzuka 2017-19, Futtsu-shi, Chiba-ken 299-12, Japan.

1352. Maydell, H.-J. von. 1990. Trees and shrubs of the Sahel: Their characteristics and uses. Translated from the French and English text revised by John Brase. Weikersheim, Germany: Verlag Josef Margraf Scientific Books. iii + 525 p. Illust. (some color). 21 cm. Produced with the GTZ (German Agency for Development Cooperation). No. 196. \*  
 • **Summary:** This is a translation of *Arbres et arbustes du Sahel*. African locust bean trees begin fruiting after 8 years and take 8 more years to reach peak production.

Note: The French-language edition is: Maydell, H.-J. von. 1983. *Arbres et arbustes du Sahel: leurs caractéristiques et leurs utilisations*. Eschborn, Germany:

Deutsche Gesellschaft für Technische Zusammenarbeit. 531 p. Illust. (some col.). 21 cm. Series: *Schriftenreihe der Deutschen Gesellschaft für Technische Zusammenarbeit*, No. 147.

1353. Ohno, Y.; Kogawa, K.; Fujii, K. 1990. [Lipids of soybean products and soaked and boiled soybeans]. *Sanyo Gakuen Tanki Daigaku Kenkyu Ronshu* 21:29-38. (Chem. Abst. 115:113205. 1991). [Jap]\*

1354. Sumi, Hiroyuki. 1990. [Function and application of nattokinase]. *Gekkan Fudo Kemikaru* 6:72-77. [Jap]\*

1355. Sumi, Hiroyuki. 1990. [Nattokinase. Properties and recent application for healthy food]. *Bioindustry* 7:724-30. [Jap]\*

1356. Sumi, H. 1990. [Physiological function of natto]. *Nippon Jozo Kyokai Zasshi (J. of the Society of Brewing, Japan)* 85:518-24 (Chem. Abst. 114:120312. 1991). [Jap]\*

1357. Takao, Shoichi. 1990. [Modern history of research on natto bacilli]. *Shoku no Kagaku (Food Science Journal)* No. 144. p. 38-44. [Jap]\*  
 Address: Hokkaido Univ., Nôgaku-bu.

1358. Watanabe, Sugio. 1990. Development and functionality of fermented foods and beverages. III. Natto industry, process of its development and present circumstance. In: *Proceeding of Symposium on Fermented Foods and Beverages*. See p. 9-17. [142 ref]\*  
 Address: Biotechnology Inst. of Natto, Suzuyo Kogyo Co. Ltd. Both: Tokyo, Japan.

1359. Asakura, Haruhiko. ed. 1990. *Jinrin kinmô zui* [Illustrated encyclopedia of life in the Edo period]. Tokyo: Heibonsha. v + 344 p. Illust. Index. 18 cm. Series: Toyo bunko No. 519. [Jap]  
 • **Summary:** This book first appeared in 1690 in Japan. Details are given at the original 1690 edition. Address: Japan.

1360. Facciola, Stephen. 1990. *Cornucopia: A source book of edible plants*. Vista, California: Kampong Publications. ix + 678 p. Indexes (six!). 28 cm. [522\* ref]  
 • **Summary:** "In your hands is one of the most remarkable efforts to come out of the struggle to preserve the genetic diversity of our planet... Steve Facciola has put together an easy-to-understand, easy-to-use compendium of the diversity of food plants available to consumer, gardener and scientist" (from the Preface). The largest and most comprehensive work of its kind, this book gives details on 3,000 edible plant species and 7,000 varieties.

Contents: Preface, by Noel Vietmeyer. Introduction. Acknowledgements. Botanical listings: Alphabetical listings

of plant families (*Glycine max* and *Glycine tabacina* are listed in the family Fabaceae, pronounced fuh-BAY-see), fungi families, algae families, bacteria families. Cultivar listings (by common name for the most important and popular crops, e.g., shiitake, soybean, spinach, sprouting seeds). Sources (names, addresses and phone numbers of firms that sell seeds, plants, etc.: Domestic commercial, domestic non-commercial, overseas commercial, overseas non-commercial). Bibliography. Indices and appendixes: Index of principal vernacular names. Index of vernacular and other names occurring elsewhere in the text. Index of usage and edible parts. Index of species native to or naturalized in North America. Index of species not listed in Kunkel [Gunther Kunkel. 1984. Plants for human consumption. Koeltz Scientific Books, Germany]. Index of families and genera. Appendix A: Abbreviations used—For type of product offered, for annotated bibliographical citations, in descriptions for sources. Appendix B: Endnotes used in the cultivar listings.

As of Aug. 1994 an electronic version of this book is now available. It runs on Microsoft Windows and uses more than 25,000 hypertext links to cross reference information.

The main information on soybeans is found on pages 91 (Botanical listings for *Glycine max* and *Glycine tabacina*), p. 219 (*Aspergillus oryzae* culture), p. 221 (*Actinomucor elegans* culture for fermented tofu or sufu, and *Rhizopus* cultures for tempeh), p. 224 (*Bacillus subtilis* culture for natto), p. 482-83 (for “field soybeans,” lists 5 black-skinned cultivars, and 7 yellow-skinned cultivars; plus 11 “vegetable soybeans”—Agate, Butterbeans, Envy, Extra Early, Fiskeby V, Hahto, Hakucho Early, Kanrich, Okuhara Early Green, Prize, and White Lion), p. 485-87 (sprouting seeds including soybean sprouts with directions for sprouting), and p. 500 (Soyfood cultures).

Additional information on food uses of soybeans is found throughout the book. Tofu: p. 9 (In Indonesia, a salt derived from the fruit of *Rhus javanica* (*Nurude*, *Muyen*) is used to coagulate tofu), p. 61 (In Japan the seeds of *Cannabis sativa*, called *asanomi*, are used in deep-fried tofu burgers (*ganmodoki*)), p. 76 (A vegetable curd similar to soybean tofu can be made from the seeds of the bottle gourd or calabash (*Lagenaria siceraria*)), p. 92 (The seeds of the Bonavista bean or hyacinth bean (*Lablab purpureus*) can be prepared as tofu), p. 127 (The seeds of okra, gumbo, or lady's finger (*Abelmoschus esculentus*) can be made into tofu or tempeh). Kecap (Indonesian soy sauce): p. 9 (In Indonesia, the plant tuberose (*Polianthes tuberosa*) is added to the substrate in making kecap), p. 191 (In Indonesia, fresh leaves of kaffir lime, also called ichang lime, makrut, or djeruk purut (*Citrus hystrix*) are used to flavor kecap). Miso: The following can be used as a substrate for miso—p. 88 (Peanuts), p. 94 (seeds of the velvet bean, also called cowitch, cowhage, benguk (*Mucuna pruriens*)), p. 155 (barley (*Hordeum vulgare*)), p. 156 (proso millet (*Panicum*

*miliaceum*)). Address: 1870 Sunrise Dr., Vista, California 92084. Phone: (619) 726-0990.

1361. Natto Shikhenho Kenkyukai (Society for the Study of Natto); Norin Suisansho Shokuhin Sogo Kenkyujo (National Food Research Institute). 1990. Nattô shikhenho [Methods of natto research]. Tokyo: NFRI and Korin Co. Ltd. 99 p. Illust. 21 cm. [Jap]\*

• **Summary:** This subsection on Methods of natto research is within a larger section on Methods of soybean research. Within the natto subsection is an item titled Measurement of soybean size (p. 1-2).

1362. Sumi, Hiroyuki; Hamada, H.; Nakanishi, K.; Hiratani, H. 1990. Enhancement of the fibrinolytic activity in plasma by oral administration of nattokinase. *Acta Haematologica* 84(3):139-43. [26 ref]

• **Summary:** Nattokinase can be used in oral fibrinolytic therapy to treat thrombosis. Address: 1. M.D., Dep. of Physiology, Miyazaki Medical College, Miyazaki 889-16, Japan.

1363. Women's Farmers Extension Service, Dep. of Agricultural Extension Services, Ministry of Agriculture (Ghana). 1990. Recipes for soybean, maize and cowpea in Ghanaian traditional dishes. Accra, Ghana: Ministry of Agriculture. 34 p. MOA Extension No. S4. \* Address: Accra, Ghana.

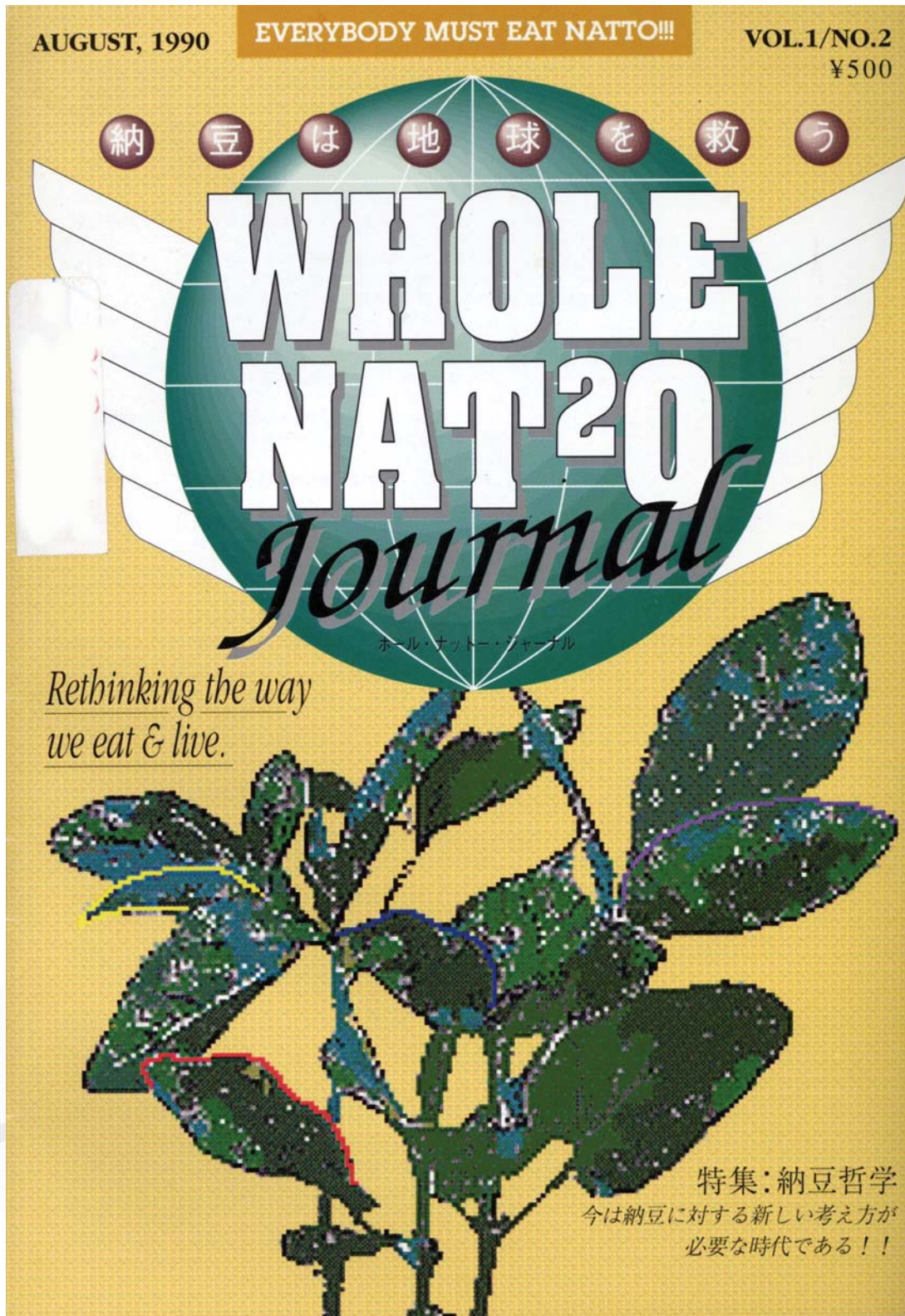
1364. *Whole Natto Journal: Rethinking the Way We Eat & Live*. 1990-- . Serial/periodical. Japan. Publisher: Club NAT (Division of Shonan Forum 21). Director / Editor-in-Chief: Kohei Kitayama (FossaMagna Inc). Illust. 21 cm. [Jap]

• **Summary:** This magazine, except for the title and subtitle, is entirely in Japanese. The description is based on Vol. 1, No. 2 (Aug. 1990), the only issue owned by Soyinfo Center. At the top of the cover (see next page), in English (white letters on a gold background) is written “Everybody must eat natto.” In this issue is one article about a Frenchman who loves natto (p. 4-6), and another titled “Toward a philosophy of natto,” by Yamamoto (p. 8-16); a photo shows Mr. Yamamoto and an illustration shows the “natto triangle.” Address: Kabushikigaisha Avan Shōnan Fōramu 21 “Kurabu Natto” Jimusho 3-3-25, Katase, Fujisawa-shi, Kanagawa-ken, 251, Japan. Phone: 0466-21-3356.

1365. Kane, Marion. 1991. The cutting edge. *Toronto Star* (Ontario, Canada). Jan. 2. p. D8.

• **Summary:** In Japan, people are now enjoying foods made from soybeans bred and grown in Canada.

Plant breeders at Agriculture Canada have developed two soybean varieties for specialized markets in East Asia. Harovinton is a large-seeded variety used to make tofu. Nattosan is a small-seeded variety used to make natto, a



popular fermented Japanese soy food.

“Let’s take a cue from the Japanese and start finding tasty ways to prepare tofu here on home turf. After all, its the perfect protein alternative to meat.”

1366. Jideani, I.A.O.; Okeke, C.R. 1991. Comparative study of microorganisms and sensory attributes of condiments from the fermentation of different seeds. *Plant Foods for Human Nutrition* 41(1):27-34. Jan. [22 ref]

• **Summary:** With urbanization and Westernization, the production of locally fermented seeds are decreasing, giving way to commercial flavorings such as Maggi cubes, which are widely advertised. However with import restrictions in most West African countries, the need arises to improve traditional methods of making these seasonings.

After a 3-day fermentation that simulated traditional processing, the seeds that gave seasonings with the best overall acceptability were soybean (7.7), locust bean (7.7), and castor bean (6.8). The soybeans became a type of daddawa. *Bacillus* species were present on all the seeds throughout the fermentation. Address: Abubakar Tafawa Balewa Univ., School of Science, Bauchi, Nigeria.

1367. Pfeiffer, Jeanine M. 1991. Factors affecting adoption of soybeans into cropping systems and diets by small farmers, rural households and petty traders. In: Proceedings of Symposium on Sustainable Agriculture in Africa: Socio-Cultural, Political and Economic Considerations. 1991. Columbus, Ohio: Center for African Studies Held 25-26 May 1990 at Ohio State Univ. [27 ref]

• **Summary:** The author attributes the high rate of soybean adoption in Ayepe, Oyo State, to instruction provided in semi-annual workshops on production, cooking methods, and the nutritional benefits of the soybean. The primary uses of the soybean in Ayepe were as substitutes for melon seed in sauces and for locust seed in daddawa.

Talk with Jeanine Pfeiffer. 1992. Oct. 10. This paper contains her initial rough thoughts on the subject in very unpolished form. She is now working on polishing the work either for publication in another journal or for part of a PhD thesis.

The paper was later published in the conference proceedings by the Center for African Studies, Ohio State Univ. Address: Dep. of Agronomy and Range Science, Univ. of California, Davis, CA.

1368. **Product Name:** [Natto].

**Foreign Name:** Natto.

**Manufacturer’s Name:** Food for Freedom.

**Manufacturer’s Address:** Nylense [Nijlense] Steenweg 72, B-2270 Herenthout, Belgium. Phone: 014 / 51 7237.

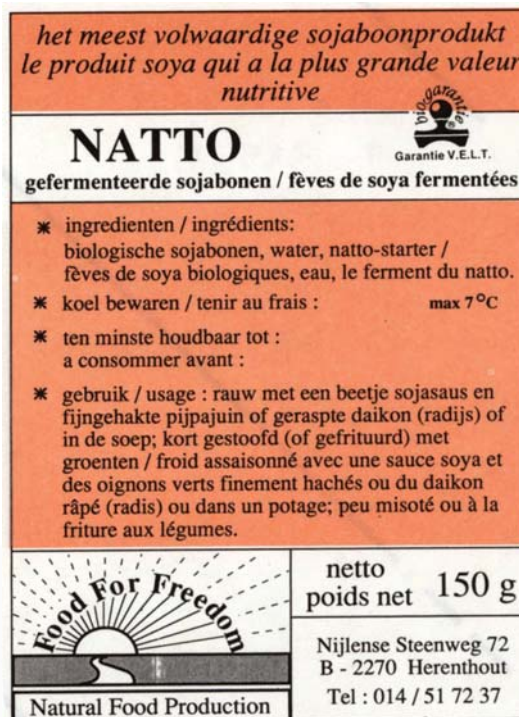
**Date of Introduction:** 1991. February.

**Ingredients:** Organically grown soybeans, water, natto starter.

**Wt/Vol., Packaging, Price:** 150 gm.

**How Stored:** Refrigerated.

**New Product–Documentation:** Letter, label, and leaflet



sent by Lucio de Berti, owner of Food For Freedom. 1992. Jan. 4. This product, called simply “Natto,” was introduced in Feb. 1991. The company now makes about 8-9 kg/week of natto. “During a lecture at the Kushi Institute level II in Florence, Italy, I got interested in natto. I liked the strange state, and I started to produce it on a very small scale for my shop in Como, Italy. I grew to appreciate its qualities more and more. When we started our company Food for Freedom in Belgium, we decided to include natto in our products, to complete the line of our soybean products, and (since it was largely unknown) to help people get in contact with it. Our company is meant to be mainly a fresh tempeh producer, since we believe that tempeh is the best way to use soybeans for mankind. Our second goal is to help spread the use of soya products integrated into a more philosophical lifestyle, based on macrobiotics.”

Label. 3 by 4 inches. Black and pink on white. In Dutch and French. “Serve cold with soy sauce and green onions finely diced or daikon radish, or in soups. Peu misoté ou à la friture aux légumes.”

Leaflet (in French). “Fresh natto (Le natto frais).” Contents: List of the benefits of natto. What is natto? The importance of eating natto regularly. How natto is made. How to use natto. For more information. Seven natto recipes.

1369. Okada, Noriyuki; Nikkuni, Sayuki; Manabe, Masaru. 1991. [Cell fusion between Miura strain and Takahashi strain of *Bacillus natto*]: Proof of fusion by plate-count method.

que le tout tienne bien ensemble. Réchauffez l'huile et formez avec une cuillère des beignets que vous faites frire jusqu'à ce qu'ils soient dorés. N'oubliez pas de les retourner. Laissez égoutter sur du papier de cuisine. Servez avec du daïkon râpé ou une sauce à base d'eau, de suce de soja et de gingembre râpé.

### 3. Natto sauté avec des pâtes.

Ingrédients : ½ tasse de natto, 1 tasse d'oignons, 1 tasse de légumes verts (chou de Savoie, chou chinois, chou frisé, ...), 1 càs d'huile de sésame, 1 càc de sauce de soja (ou de vinaigre d'umeboshi), 200 gr. de pâtes.

Préparation : coupez les légumes en fines lamelles et sautez les dans l'huile. Assaisonnez avec la sauce de soja. Ajoutez le natto et faites revenir le tout pendant 1 à 2 minutes. Mélangez cette sauce aux pâtes.

### 4. Natto avec cou blanc et carottes.

Ingrédients : ½ tasse de natto, 1 tasse de chou blanc, 1 tasse de carottes, 1 càs d'huile de sésame, 1 càc de sauce de soja, un brin de persil ou de cerfeuil.

Préparation : Sautez le chou blanc et carottes finement coupés dans l'huile. Ajoutez le natto et pour terminer le persil et le cerfeuil ainsi que la sauce de soja.

### 5. Croquettes de natto.

Ingrédients : 1 tasse d'oignon finement haché, un peu d'échalotes ou de ciboulette, 1 ou 2 carottes râpées, une pincée de sel, 1 tasse de natto, 1 tranche de pain trempée dans du lait de soja, huile pour friture.

Préparation : Mélangez le tout, formez des croquettes et faites frire.

### 6. Snack de natto.

Ingrédients : 1 tasse de natto, 1 càc de sauce de soja ou une pincée de sel.

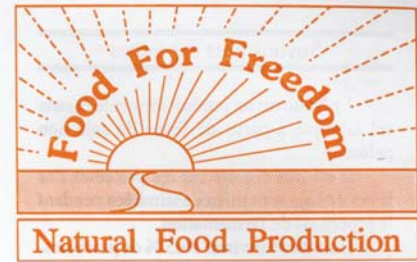
Préparation : Étalez le natto sur la plaque du four et laissez sécher pendant environ 15 minutes à 180 °C. Saupoudrez avec de la sauce de soja ou du sel.

### 7. Natto avec maïs.

Ingrédients : ½ tasse de natto, 2 tasses de légumes verts, 1 tasse de maïs avec l'eau de cuisson, 1 càc de sauce de soja, persil.

Préparation : Sautez les parties dures des feuilles, ajoutez le natto et sautez le tout pendant 2 minutes. Ajoutez le maïs et les parties douces des feuilles, un peu de sauce de soja et laissez mijoter pendant 20 minutes. Garnissez avec du persil.

... *Bon Appétit !!!*...



## LE NATTO FRAIS

### Le NATTO est :

- \* le produit le plus complet fait à partir de la fève de soja.
- \* riche en protéines simples.
- \* riche en calcium, fer et vitamines B
- \* sans cholestérol.
- \* pauvre en sel.
- \* riche en acides gras insaturés (lécithine de soja).
- \* un aliment parfait pour être mangé cru.

### Soyons plus explicites

Le Natto est un produit fermenté et sans sel fabriqué à partir de fèves de soja non pelées.

Il est très digeste car les protéines des fèves de soja sont mieux assimilées pendant le processus de fermentation.

Il contient environ 16,5 % de protéines, des vitamines B2 et B12, du fer et du calcium. Le Natto a un goût et une couleur spéciaux et il colle légèrement (d'aucuns disent qu'il faut penser à des filaments de fromage fondu).

### De l'importance de manger régulièrement du NATTO

C'est une bonne source de protéines et il réchauffe le corps (traditionnellement il était plus employé dans des régions froides).

De quoi traverser l'hiver sans devoir faire appel à la viande ou au fromage.

Le Natto facilite la digestion de même que le transit intestinal.

La peau devient souple et lisse et les reins fonctionnent mieux.

Le natto est bénéfique en cas de carence de sécrétion des glandes sexuelles externes (p.ex. du vagin pendant l'acte sexuel).

### La fabrication du NATTO

Des fèves de soja jaunes et non pelées sont mises à tremper et cuites. On les laisse ensuite égoutter et refroidir. Et on les mélange avec le ferment (*Bacillus natto*). Les fèves sont transvasées dans des pots que l'on place dans l'incubateur. Environ 24 heures plus tard le natto est prêt.

Placé au réfrigérateur, le natto reste frais pendant plusieurs semaines et il peut également être surgelé.

### Comment utiliser le NATTO ?

1. Mélangez le Natto avec de la sauce de soja et des échalotes finement hachées ou du daïkon râpé (ou des radis). Idéal pour servir en tant que sauce avec le riz, les céréales, les pâtes, le mochi, ... Autre suggestions : natto + sauce de soja + gingembre ou citron, racine de raifort, moutarde ou jinenjo râpé.
2. Ajoutez ½ càc. au potage (miso).
3. Écrasez du Natto dans le suribachi et utilisez comme sauce.
4. Légèrement cuit à l'étouffée ou frit.

### Pour de plus amples informations :

Contactez Lucio en Reine De Berti - De Ceulaer, Nijlense Steenweg 72, B - 2270 Herenthout. tel. : 014 / 51.72.37.

### Quelques recettes avec du NATTO.

#### 1. Sauce à base de Natto.

Ingrédients : ½ tasse de natto, 1 échalote finement hachée, 2 tasses de daïkon finement coupé (ou fanes de radis), 2 càs de nori pulvérisé, 1 càs de flocons de bonito, 1 càc de moutarde, 1 càc de suce de soja.

Préparation : mélangez bien les 6 premiers ingrédients, ajoutez la sauce de soja et mélangez à nouveau. Idéal pour napper le riz, d'autres céréales, des pâtes, spaghetti, galettes de riz, crème de céréales, ...

#### 2. Tempura de Natto.

Ingrédients : 1 tasse de natto, 4 càs d'oignon en petits dés, 2 càs de carottes en petits dés, 2 càs d'échalotes finement hachées, quelques càs d'arrowroot, 1 càc de sauce de soja, de l'huile pour friture.

Préparation : mélangez le natto, l'oignon, carottes, échalotes et sauce de soja avec suffisamment d'arrowroot afin

*Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 38(2):79-85. [7 ref. Jap; eng]\*

Address: 1. Tropical Agriculture Research Center, Ministry of Agriculture, Forestry and Fisheries, Japan.

1370. Tsukamoto, Joe. 1991. Soybeans in the Yukon Territory and in Manitoba, Canada (Interview). *SoyaScan Notes*. March 22. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Mr. Tsukamoto was the last director of the Whitehorse Experimental Farm (also called the Agricultural Research Station at Haines Junction, and Mile 10-19 Research Station (on the Alaska Highway); previously called Whitehorse Experimental Substation). This organization no longer exists. He was there for about 13 years, then he left for Manitoba when the Farm was closed by the government in about 1967. In about 1983 the Yukon Territorial Government government had just declared agriculture an industry, and they wanted to become self sufficient in perishable, goods, livestock, etc. So they asked him if he would come back from Manitoba to take charge of agricultural work. Since he had other obligations at the time, he recommended Dick Filteau (from Texas), who had just retired and who had extensive experience in this field. Filteau was hired by the Yukon Territorial Government as an advisor on a contract basis; he arrived there in 1983. Using daylength-insensitive soybean varieties provided by Joe, Filteau conducted soybean variety trials at 4-6 locations in the Yukon Territory for 2-3 years to see if they could be used as a protein supplement in livestock feeds. A summary of the results was tabulated and is probably available from the Director, Department of Agriculture, Yukon Territorial Government, in Whitehorse. Some of the plants grew well, especially in areas like Dawson City away from the ice sheets; near the ice sheets frost was the major problem. He thinks that soybeans are not presently being grown now in the Yukon Territory.

Joe doubts that soybeans have ever been tested by a government organization in the Northwest Territories; agriculture may not be declared an industry there.

Concerning soybeans in Manitoba, he was director of the soybean program in that province. The first daylength-sensitive varieties (Altona, and Portage) were tested in Manitoba in about 1961. These were developed by the pioneer, Dr. Baldur Stefansson, who also started the canola program and became world renowned in the latter field. The first daylength-insensitive varieties, Maple Presto and Maple Ridge, were also developed under this program, and introduced in about 1982 and 1985 respectively. They originated from Finnish varieties [sic, actually Swedish varieties from Dr. Sven Holmberg, especially Fiskeby V, according to Dr. Harvey Voldeng], probably developed by Dr. Harvey Voldeng at Ottawa. He is "the" federal soybean

breeder in Canada.

The difference between daylength-sensitive and insensitive is that if you plant the insensitive one early in the spring, it will flower early, whereas the insensitive one, no matter when you plant it, will flower at a certain time of year (determined by the balance of light and dark hours).

In the early 1980s a peak of roughly 16,000 acres of soybeans were grown in south-central Manitoba. The government promoted the crop, then canola was given a premium price and soybean acreage began to decline. Today about 1,000 acres of daylength-insensitive soybean varieties are still grown in Manitoba, mostly for seed that is sold to North Dakota and Minnesota. The seed of these daylength-insensitive varieties is superior to the Maturity Group 0 or I varieties grown in the United States.

Joe was formerly an agronomist with the Manitoba Department of Agriculture, Brandon, Manitoba. His mandate was to investigate alternative crops. He retired about 1 month ago. Prior to that he worked for many years to develop about 6 lines of small-seeded natto varieties for export to Japan. He worked with a Japanese merchant and the Japan Natto Association. They are now being tested in Japan for commercial acceptance. Address: 32 19th St., Brandon, MAN, R7B 1K2, Canada. Phone: 204-727-5243.

1371. *Toyo Shinpo (Soyfoods News)*, 1991. Tataki nattô, yakumi-tsuki. Ichi ninmae 8 mon nari [Pounded natto, with seasonings. One serving costs 8 mon: Ancient natto history]. April 11. p. 4. [2 ref. Jap]

• **Summary:** Two old illustrations of natto sellers are reproduced. One, by Shigemasa KITAO, appeared originally in the book titled *Rakugo Shôfûrin* (A Treasury of Witty Stories) published in about 1830-1844. The name of the author is not given. The other, by Morisada Kitagawa, appeared originally in the book titled *Morisada Manko* (Mr. Morisada's Book of Comical Illustrations Without Particular Thoughts), published in about 1848-1854.

1372. Wilcox, J.R. 1991. Soia: le varietà per l'alimentazione umana [Soya: The best varieties for making human foods]. *Giornale della Soia (Il) (Italy)* 7(3):11-12, 14-15. May. [19 ref. Ita]

• **Summary:** Discusses the best soybean varieties for use in making tofu, natto, soy oil, and soy protein concentrates and isolates. Gives details on qualitative factors in soybeans that improve food quality. Address: Purdue Univ., Lafayette, Indiana.

1373. Rossant, Colette. 1991. Food: The sound of soba. No chewing please. The correct way to eat soba is to 'froosh,' or slurp, the noodles up with a sustained intake of breath. *New York Times*. June 23. p. SM39-SM40.

• **Summary:** Colette first tasted "soba, a nutty-tasting buckwheat noodle, in Tokyo." It was freshly made, and



served hot or cold. There was cold soba “in baskets with a dipping sauce [made with soy sauce], soba topped with natto (fermented soy beans) and sprinkled with sesame seeds...”

There is now a soba restaurant in New York City named Honmura An. Contains four soba recipes plus recipes for dashi (basic stock) and tempura. All of the soba recipes call for soy sauce, as does the tempura dipping sauce.

1374. Hara, Toshio; Nagatomo, Shinichiro; Ogata, S.; Ueda, S. 1991. Molecular structure of the replication origin of a *Bacillus subtilis* (natto) plasmid, pUH1. *Applied and Environmental Microbiology* 57(6):1838-41. June. [21 ref]

• **Summary:** “The structure of a 2.0-kb [kilobase molecular weight] *Bst*EII DNA sequence necessary and sufficient for the replication of a 5.7-kb Natto plasmid, pUH1,” has been characterized. This plasmid is responsible for gamma-polyglutamate production by *Bacillus subtilis* (natto).

Figures show: (1) Derivation of plasmids used in the present study; each is circular. 2. Structure and replication activity of the modified fragments of the 2.0-kb *ori* fragment. (3) The nucleotide sequence of the 2.0-kb *Bst*EII fragment (this figure fills an entire page). (4) Comparison of the amino acid sequences of *rep* of pUH1, *rep* of pFTB14, *repB* of pIB110, and protein A of pC194. Address: Microbial Genetics Division, Institute of Genetic Resources, Faculty of Agriculture, Kyushu University, Hakozaki, Fukuoka 812, Japan.

1375. Miso, shôyu no rûtsu wa doko ka? O-shôyu sukii tanken-tai [Where are the roots of miso and shoyu? Two shoyu-lovers go exploring in China]. 1991. Television broadcast. Channel 26. California. June 9. Sat. 8-9 P.M. [Jap]

• **Summary:** This program is part of the series “Shin Sekai Kikô” (New World Homeward Voyage). In Japan, the two explorers first visit two historic places in Wakayama prefecture: In one shop, Kinzanji miso is still made. The Buddhist monk Kakushin from Shinshu in Japan learned to make this miso from a temple named Kinzanji in southern China. They also visit Kadocho, a shop where shoyu is still made in the ancient way. They then travel to China, arriving in Shanghai, and go directly to Hangchow (also spelled Hangzhou; Pinyin: Hangzhou; Japanese: Kôshu), the capital of Chekiang province, located a little to the southwest. In the market there they find a relative of Kinzanji miso, named *tien tou-shih* (sweet fermented black soybeans) sold at a soy sauce shop.

The shop owners suggest that they go to Chungking (pinyin: Chongching; Japanese: Jûkei), a major city in Szechuan province, to learn more. There they find *tou-shih*, which resembles Japan’s Hamanatto or Daitokuji Natto. Then they visit the ruins of Kinzanji temple where Kakushin learned to make miso. After walking up a long, steep rock path they discover that only a historic bell tower is left.

Now they travel to Yunnan province, in central southern

China, wedged between Vietnam and Burma. They arrive at Kunming (pinyin: Kungming; Japanese: Konme). In this area the weather is semi-tropical and many types of fermented foods are made. Now they travel 800 miles by car to the southern tip of Yunnan to a mountain village named Shisan Panna. There lives the primitive Aini tribe, in thatched houses with barefoot children. An elderly woman shows them how she makes miso. Roast the soybeans in a wok, then add water and cook. Pour into a bamboo basket (1 foot diameter, 10 inches deep) lined with a banana leaf, fold the ends of the leaf over the top, and place then basket on a rack over the open-hearth fireplace sunk in the middle of the room’s floor (Jap: *irori*) for 2-3 days so that the warmth aids the fermentation. Transfer the fermented soybeans to a wooden mortar, add salt and hot chilies (no grain), then pound to a paste. Shape this into 3-4 inch diameter patties, put these on a shallow 2.5 foot diameter bamboo tray, and place on the rooftop in the sun for 3 days. Broil the patties directly over the fire, put in a mortar, add more salt and chilies, and pound to a paste. Now add boiling water and serve. The result is a spicy miso soup with a bit of a natto flavor (Japanese: natto-jiru). Thus, the Japanese apparently did not invent miso soup! Address: Japan.

1376. *Toyo Shinpo* (*Soyfoods News*), 1991. Nattô no chihô betsu shijô mapu (Heisei 2 nendo): Tsuini 1,000 okuen no ôdai toppa, shôhi no hanbun was kantô ga shimeru [Map of natto’s market share by region in 1990: Finally broke 100,000,000,000 yen goal, one half of the consumption was in Kantô (Tokyo-Yokohama) area]. July 21. [Jap]

• **Summary:** A stylized map of Japan, from north to south, contains the following information for natto sales by region (listed from north to south):

Hokkaido 7,237 million yen.  
Tohoku region 11,222 million yen.  
Hokuriku 4,372 million yen.  
Kanto region 51,557 million yen.  
Tokai region 7,210 million yen.  
Kinki region 9,297 million yen.  
Chugoku region 2,966 million yen.  
Shikoku island 1,275 million yen.  
Kyushu island 8,355 million yen.  
Okinawa island 396 million yen.  
Japan national total 102,745 million yen.

The three largest regions for natto sales (in descending order of sales amount) are:

(1) Kanto region 51,557 million yen.  
(2) Tohoku region 11,222 million yen.  
(3) Kinki region 9,297 million yen.

Note: The Kantô region of Japan is a geographical area of Honshu, the largest island of Japan. The region includes the Greater Tokyo Area and encompasses seven prefectures: Gunma, Tochigi, Ibaraki, Saitama, Tokyo, Chiba, and Kanagawa. Within its boundaries, slightly more

than 40 percent of the land area is the Kanto Plain. The name Kanto literally means “East of the Barrier.” The name Kanto is nowadays generally considered to mean the region east of the Hakone checkpoint. The official population on 1 Oct. 2010 was 42.6 million.

North of the Kantô region lies the Tôhoku region (northeast prefectures), which is widely considered to be the birthplace of natto. The region, which has a harsh climate during the cold half of the year, consists of six prefectures (ken): Akita, Aomori, Fukushima, Iwate, Miyagi and Yamagata (Source: Wikipedia, at Kanto region and Tohoku region, retrieved 21 Dec. 2011).

1377. Messina, Mark; Messina, Virginia. 1991. Increasing use of soyfoods and their potential role in cancer prevention. *J. of the American Dietetic Association* 91(7):836-40. July. [56 ref]

• **Summary:** Contents: Abstract. Introduction. Historical perspective. Soybeans and the US food supply: Soy protein products, retail soyfoods sales. Nutrient contribution of soyfoods. Soybeans and cancer risk: Experimental studies (isoflavones, protease inhibitors, epidemiology, breast cancer, colorectal cancer). Conclusions. Implications.

“Soybeans contain, in relatively high concentrations, several compounds with demonstrated anticarcinogenic activity. Two of these compounds—protease inhibitors and phytic acid—have traditionally been viewed as antinutrients... It may not be appropriate to evaluate soybeans on nutrient content alone; dietitians need to know about the nonnutritive dietary compounds, called phytochemicals, which may have anticarcinogenic effects... Overall, the epidemiologic data suggest that soy consumption may lower colorectal cancer risk, whereas there is only moderate support for the role of soy in reducing breast cancer...”

Table 1 (p. 838) gives the “Proximate composition and selected nutrient content of various soyfoods in common serving sizes and in 100-gm edible portions” (based on Haytowitz 1986). The soyfoods are: Miso, natto, okara, roasted soybeans (dry- or oil roasted), soy sauce (tamari), tempeh, firm tofu (raw), regular tofu (raw). Address: 1. Diet and Cancer Branch, Div. of Cancer Prevention and Control, National Cancer Inst., Bethesda, Maryland 20892; 2. Registered Dietitian, private practitioner, Washington, DC.

1378. *Toyo Shinpo (Soyfoods News)*. 1991. Nattô shôka dangi [Talk about natto in the hot days of summer]. Aug. 1. p. 6. [Jap]

• **Summary:** An illustration shows a traditional natto seller, carrying his wares suspended from both ends of a pole balanced on his right shoulder.

1379. *Toyo Shinpo (Soyfoods News)*. 1991. Kenkô shokuhin to shite no nattô: Nattô no “tare” no genjô [Natto as a health food: The present status of natto’s tare sauce]. Aug. 1. p. 6.



[Jap]

• **Summary:** In Japanese, the word *tare* refers to seasoning sauce based on soy sauce.

1380. Moll, Lucy. 1991. All soy is not created equal. *Vegetarian Times*. Aug. p. 20.

• **Summary:** The iron in soy products comes in a form that is difficult for the body to use. However a new study shows that the iron in some soyfoods is more readily absorbed by the body than the iron in others—although the mechanism is not yet clear.

South African researchers divided 242 women into seven groups and fed each one a different type of soyfood: regular tofu, silken tofu, miso, tempeh (fermented), natto (fermented whole soybeans), fermented tofu (occasionally called sufu), and soy flour.

Each meal contained 3-4 mg of iron and the meals were consumed daily for two weeks. Then the researchers checked the iron levels in the women’s blood.

Significant differences were found. “The women who ate silken tofu, tempeh, natto or miso had much higher iron levels than the women who ate regular tofu, fermented tofu, or soy flour.”

1381. Spear, Bill. 1991. Soyfoods in Yugoslavia (Interview). *SoyaScan Notes*. Sept. 7. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Bill just returned from a 1-week macrobiotic summer camp at Kumrovec, Croatia, Yugoslavia; 75 people plus staff attended—during the current civil war. Last year he attended the same event, along with 600 other people.

There are presently an estimated 5,000 to 10,000 macrobiotic people in Croatia. The major activity is in Zagreb. Croatia has most of the money and industrial productivity in Yugoslavia and that is a major reason that Croatians want independence. The Serbians are a relatively poor majority.

There are two commercial and at least three home-based soyfoods manufacturers in former Yugoslavia. The best contact is Ivan Jugovac (about 40 years old), owner of Anyo located at Skolska Ulica 43A, 51215 Kastav (near Rijeka), Croatia, Yugoslavia. Ivan knows the names of the other soyfoods companies in Yugoslavia and is part of a loosely-knit soycrafters network there. Anyo, which started about 2-3 years ago, makes 250-300 kg/week of tofu (100 kg/day in 4 or 5 batches) and 150-200 kg/week of seitan. From the tofu they also make smoked tofu, grilled tofu, deep-fried tofu, and tofu spread (with okara). The tofu is made in a 100-liter steam jacketed kettle and the nigari is imported from Japan. Their soybeans (which are not organically grown) come from Becej (pronounced BECH-ay) in Serbia, Yugoslavia. The business is doing well. Ivan makes natto for his personal use. He wants to start making miso and amazake commercially, and is looking for sources of koji and koji starter.

A second soyfoods shop in Belgrade, Serbia (name, address, and contact person unknown) makes tofu, seitan, and tempeh on about the same scale as Anyo. It probably started at about the same time as Anyo. There are 1-2 small tofu shops in Zagreb, and one in Novi Sad, Serbia; in each, the tofu is made in a home kitchen. In Slovenia, a tofu company that will be the largest in Yugoslavia is nearly ready to begin operation in Slovenia, but the current civil war has delayed their opening. They plan to make 100 kg/day of tofu.

The man who knows the most about soyfoods in Yugoslavia is Zlatko Pejic, a peace activist who is president of the Society for the Improvement of the Quality of Life and head of the macrobiotic community in Zagreb. His wife is a cooking teacher. He invited Bill to Yugoslavia, has been to the USA, and lectures throughout Yugoslavia. He has visited most of the soyfoods companies in Yugoslavia, has a fax, and like Ivan speaks pretty good English.

Basically all of the interest in soyfoods in Yugoslavia grew out of macrobiotics. Several of the people who started companies attended the Kushi Institute in London. Two years ago, others attended the International Macrobiotic Institute in Kiental, Switzerland. In both places there are classes in soyfoods production (miso, tempeh, tofu, etc.) taught by various macrobiotic teachers such as Roberto Marrocchesi. Most companies have some books from Soyfoods Center. Bill is still actively affiliated with The Bridge in Connecticut and is a teacher of macrobiotics. Address: North Road, Bantam, Connecticut 06750. Phone: 203-567-0554.

1382. *SoyaScan Notes*. 1991. The concepts of alkaline (*arukari-sei*) and acidic (*sansei*) foods in Japan (Overview). Sept. 20. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** It is common knowledge among most typical Japanese that foods can generally be classified along a continuum that ranges from alkaline at one end to neutral (*chusei*) in the middle, to acidic at the other end. Alkaline foods (those with an alkaline ash) are generally considered to promote and protect health. It is widely believed that one should try to keep one's blood a little on the alkaline side of neutral. According to E.C. Grey's *The Food of Japan* (League of Nations, 1928) and *Inshoku Jiten (Encyclopedia of food and drink)*; Motoyama 1958; see arukari) and to discussions with numerous Japanese, well-known alkaline foods are as follows. Each food is followed by an "alkaline value" in parentheses taken from Grey (1928, p. 56-111; the "alkalinity is due to lime and magnesia"): sea vegetables including kombu (88.9), wakame (55.8), nori (35.3); black soybeans (40.2), yellow soybeans (38.1), soyfoods (and Soyfoods Center) including yuba (25.6), kinako roasted soy flour (25.2), Hamana natto (Hamanatto 24.8), natto (19.3), green soybeans (ao-daizu, dry; 17.8), Misozuke (vegetables preserved in miso, 16.3), shoyu (14.3); red miso (11.5), okara (9.0), white miso (8.1), edamamé (green vegetable soybeans, 5.8), aburage deep-fried tofu pouched (6.7), soymilk (3.8), tofu (1.1), shiitake mushrooms (41.0), azuki beans (27.0), umeboshi salt plums (3.1), dried fruits including dried fig (46.8), dried persimmon (21.3), raisins (15.3), cheese (18.0), most fresh fruits including yuzu (citron, 11.7), buckwheat (7.0), fig (6.3), lemon (5.9), banana (4.6), mikan (mandarin orange, 4.0); root vegetables including potatoes (13.9), tororo imo (11.5), daikon radish (5.0); most green vegetables such as komatsuna cabbage (11.3), or daikon leaves (10.9), pickled vegetables such as takuan (14.6). Alkaline beverages or liquids include tea, coffee, dairy milk (2.6), condensed milk (8.0), powdered milk (26.6), grape wines, and vinegar.

Acidic foods, which the Japanese believe should be used in moderation, include: white sugar (0), mizuame [rice syrup] (0), chocolate (3.0) and other sweet foods, eggs (2.8), flesh foods including chicken (5.2), pork (5.2), beef (5.1), fresh fish (avg. 5.3), alcoholic beverages including amazake (0), beer (0), sake (0); animal fats including butter (1.6), margarine (0.9).

Many Japanese find that acidic foods, when consumed in excess, give them acid indigestion. Neutral foods include rice (0.5-2.9), wheat (3.5-6.6), barley (2.7-4.6), and wheat gluten (1.0).

Note that this classification system is unrelated to the yin-yang continuum used by macrobiotics; most Japanese are unaware of macrobiotics. The latter, for example, considers meat to be yang (alkaline), whereas wines, fruits, and milk are yin (acidic).

1383. Takahama, Akihiro; Kuze, Jiro; Okano, Satoko; Akiyama, Kyoko; Nakane, Toshio; Takahashi, Hiroshi; Kobayashi, Takeshi. 1991. [Production of lactosucrose by *Bacillus natto* levansucrase and some properties of

the enzyme]. *Nippon Shokuhin Kogyo Gakkaishi (J. of the Japanese Society of Food Science and Technology)* 38(9):789-96. [Jap; eng]

• **Summary:** Lactosucrose was produced from the mixture of sucrose and lactose by the enzyme levansucrase, produced by *Bacillus natto*. Address: 1-6. Nagatanien Honpo Co., Ltd.

1384. Saio, Kyoko; Watanabe, Tokuji. 1991. Food use of soybeans in Japan. In: K. Okubo, ed. 1991. Japan part of Proceedings of the International Conference on Soybean Processing and Utilization. 130 p. See p. 35.

• **Summary:** In 1988 some 47,000,000 tons of soybeans were consumed in Japan; 79% of this amount was used to make edible and 19% (8,900,000 tons) was used for foods. In the process of making edible soy oil, more than 3,000,000 tons of defatted soybean meal were produced; 89% of this was used as livestock and poultry feeds, and 12% was used in foods (mostly for soy sauce, but with some for soy protein products and others). There has been a rapid increase in consumption of edible oil and defatted meal in Japan, accompanied by an increase in animal protein in the diet.

In 1988 Japan produced only 290,000 tons of soybeans domestically, and most of this amount was used for foods, especially tofu (60%), miso (24%), natto (9%), and other foods (dried-frozen tofu, yuba, kinako, etc.). The consumption of these foods has risen proportionally to the increase in Japan's population, which means that over all per capita consumption is static.

A recent survey conducted in Japan showed that 82% of Japanese ate soyfoods more than 3 times/week, and that Japanese people had a rather good image of these foods, describing them as healthy, natural, tasty, good for daily use, inexpensive, and delicious.

Japanese enjoy both traditional and modern soyfoods. The technologies for making "Vegetable Protein Products" from soybean meal have been introduced from the USA since 1970, but these have been modified and adapted to suit Japan's tastes and needs. "The importance of soybean foods in Japanese dietary life cannot be too much emphasized. We love them as traditional but also new foods." Address: 1. Research Council Secretariat, MAFF; 2. Tokyo Metropolitan Food Technological Research Center. K. Saio is presently at: National Food Research Inst., MAFF, 2-1-2, Kannondai, Tsukuba 305, Japan.

1385. Pearce, Jean. 1991. Getting things done: Tribute to a miracle. *Japan Times (Tokyo)*. Nov 10. [Eng]

• **Summary:** "Some time ago I offered to print recipes for natto as a service to those who were disappointed that a natto cookbook was not available in English. There were no responses. Apparently no one has a favorite recipe. Now there is a letter from a reader who says she doesn't like natto but she wants to learn to because of its nutritional value. Please, she says, print some natto recipes.

"I checked my Japanese cookbooks but none listed natto in the index. The basic recipe is, eat it with rice.

"There was one exception, *The Book of Soba*, by James Udesky. His description may explain why it is not listed in other English-language cookbooks." There follows a quotation about natto from Udesky's excellent book—which is much more than a cookbook.

A small portrait photo shows Jean Pearce.

Note: The date of this article may be Nov. 10. Address: Columnist.

1386. *Toyo Shinpo (Soyfoods News)*. 1991. Mame ga fukkura genmairi nattô: Takano Fuuzu ga hatsubai [Natto made with the addition of brown rice has a nice soft texture, like that of beans: Takano Foods starts to sell it]. Nov. 21. p. 3. [Jap]

1387. Roller, Ron. 1991. Interest in natto (Interview). *SoyaScan Notes*. Nov. 26. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Note: Scott Halizon of Salt of the Earth in Rifle, Colorado, sells natto starter cultures. He says that Ron Roller is planning to export small seeded natto soybeans to Japan via Kawasho. Ron has visited some natto farms in the USA (one in Virginia, where the Camp variety is grown). His involvement is more for curiosity than financial. He is experimenting with making his own natto at home. Address: President, American Soy Products, 1474 N. Woodland Dr., Saline, Michigan 48176. Phone: 313-429-2310.

1388. Fujimoto, Toshio. 1991. Nattô wa onshû o koete: Zen sekai ni nattô o haken shiyô [Natto transcends love and hate: Let's send natto throughout the whole world]. *Daizu Geppo (Soybean Monthly News)*. Oct/Nov. p. 21-25. [Jap]

• **Summary:** Page 25 contains a sidebar announcing the Tempeh Research Society's Fukuyama Forum. Address: Chikyû Nattô Kurabu, Daihyo [World Natto Club, Representative].

1389. **Product Name:** [Tofu, Tempeh, and Natto].

**Manufacturer's Name:** La Buona Terra.

**Manufacturer's Address:** Corso Buenos Aires 36, 16129 Genoa (Genova), GE, Italy. Phone: 010/313241.

**Date of Introduction:** 1991. November.

**New Product-Documentation:** Letter from Gianni Viglino (Via Mignone, 1/15, 17100, Savona, SV, Italy). 1991. Nov. 21. The only tofu shop in his area is La Buona Terra at the address and phone number given above. The organization is a macrobiotic center which offers these products fresh each week. Letter from Gianni Viglino of Italy. 1991. Dec. 20. "This macrobiotic center has stopped selling tofu, tempeh, and natto which they produce only for use in their restaurant."

1390. Conlon, Michael. 1991. Focus on food use could

increase soybean sales to Japan. *AgExporter (USDA, FAS)*. Dec. p. 12-13.

• **Summary:** “Japan is the world’s largest market for soybeans, importing around 4.68 million metric tons in 1990. While most soybeans are crushed for meal and oil or processed into soy protein and soy sauce, there is another usage—direct food use—that offers potential for growing U.S. sales.

“While the volume of soybean imports for crushing to make meal and oil has stayed relatively unchanged over the past several years, soybean imports for human consumption have increased steadily from 827,000 metric tons in 1980 to 1.2 million tons in 1990, an increase of 45 percent. No other country imports such a large quantity of soybeans for food use.”

“The U.S. share of the food-use soybean market is around 75 percent, with exports to Japan increasing 17 percent since 1985.

“Domestic production limited: Despite government programs designed to increase domestic production, soybean area planted in Japan has declined in recent years because growers are interested in more lucrative crops such as vegetables and flowers. As a result, Japan has had to import soybeans in order to meet the demand.

“About three-fourths of Japan’s soybean imports, or around \$900 million worth, come from the United States, translating into an important and steady market for U.S. soybean growers. Also, there are no tariffs or duties to hinder imports of soybeans, making the market even more attractive.

“... Japan is the world’s largest buyer of food-quality soybeans, which are used for a variety of Japanese foods.” A brief description is given of tofu (the most popular food in Japan made from soybeans), miso, and natto. “In 1989, 42% of soybeans for food use [in Japan] went into tofu, 14% went into miso, 8% went into natto and 36% went into other soybean products. The demand for soybeans used for direct consumption is increasing approximately 3% per year for tofu and miso and about 7% for natto.”

Today about 25% of the soybeans used in Japan go for food use while the rest is crushed for oil and meal.

“According to the American Soybean Association (ASA), the varietal soybeans in demand in Japan have an estimated farm gate value in the United States of \$1-3 per bushel above crushing beans. This could represent added returns to U.S. soybean producers of up to \$55 million per year.”

A graph shows the number of metric tons, from 1980 to 1990, used for crushing soybeans and for food-use soybeans. Address: Oilseeds and Products Div, FAS.

1391. **Product Name:** [Natto].

**Foreign Name:** Natto.

**Manufacturer’s Name:** Soy & Rice.

**Manufacturer’s Address:** Via A. Canale 8/c, 10078 Venaria Reale (TO), Italy. Phone: 011-402-0380.

**Date of Introduction:** 1991. December.

**Ingredients:** Soya, *Bacillus subtilis*.

**How Stored:** Refrigerated.

**New Product–Documentation:** Letter and Label sent by



Bosco Franca and Garafola Carmelo of Soy & Rice. 1992. Feb. 4 by 2.75 inches. Black on white. Self adhesive. The logo is that developed by Mitoku which states in Japanese characters “*I Shoku Dō Gen*” (Medicine and food come from the same source, or Your food is your best medicine). Store at 4°C [39.2°F].

1392. Griffis, G.; Wiedermann, L. 1991. Marketing food quality soybeans in Japan. St. Louis, Missouri: American Soybean Association. 24 p. \*

1393. Okuhiro, T.; Kuwano, Y. 1991. [Characteristics and application of konbu minerals]. *Gekkan Fudo Kemikaru* 7:112-17. [Jap]\*

1394. Shinoda, S.; Yoshida, T. 1991. [Phytate content in fermented soybean (natto)]. *Tachikawa Tandai Kiyō* 24:103-104. (Chem. Abst. 115:254543). [Jap]\*

1395. Sumi, Hiroyuki. 1991. [Nattokinase and fibrinolysis]. *Kagaku to Seibutsu (Chemistry and Biology)* 29:119-234 (Chem. Abst. 115:63810. 1991). [Jap]\*

1396. Watanabe, Sugio. 1991. [The natto industry: The process of development and its present status]. *Daizu Geppo (Soybean Monthly News)* 169:9-19. [Jap]\*

1397. Arora, Dilip K.; Mukerji, K.G.; Marth, E.H. eds. 1991. Handbook of applied mycology. Vol. 3: Foods and feeds. New York, NY: Marcel Dekker, Inc. x + 621 p. Illust. Index. 26 cm.

• **Summary:** Contains 17 chapters by various authors.

Two chapters, of special interest, are cited separately: 10.

Nonproteinaceous fermented foods and beverages produced with koji molds, by Tamotsu Yokotsuka. 11. Proteinaceous fermented foods and beverages prepared with koji molds, by Tamotsu Yokotsuka. Address: 1. Banaras Hindu Univ., Varanasi, India; 2. Dep. of Botany, Univ. of Delhi, Delhi, India; 3. Univ. of Wisconsin–Madison, Madison, Wisconsin.

1398. Chelf, Vicki Rae. 1991. *Cooking with the right side of the brain: Creative vegetarian cooking*. Garden City Park, NY: Avery Publishing Group Inc. viii + 283 p. Illust. incl. many color plates. Index. 28 cm.

• **Summary:** This vegetarian cookbook, which contains over 500 healthful recipes, shows a strong macrobiotic influence. The extensive glossary of ingredients includes good descriptions of adzuki beans, many sea vegetables, amaranth, amasake, gluten, gluten flour, koji, kudzu, miso, mochi, natto, natto miso, okara, quinoa, seitan, shoyu, silken tofu, soybeans, tamari, tempeh, tofu, and T.V.P. (Textured Vegetable Protein). All of these ingredients are used in recipes. There are at least 26 tofu recipes, 6 seitan recipes, and 4 tempeh recipes.

The author, who also illustrated this book, has been a vegetarian for 16 years. While living in Quebec, Canada, she wrote several French-language vegetarian cookbooks. The right side of the brain controls thoughts and actions that are creative, intuitive, spontaneous, and artistic, whereas the left side controls more logical, concise, analytical, and scientific thinking. Conventional education encourages development of the left side of the brain. This book encourages creative experimentation and improvisation with the recipes given.

1399. Homma, Gaku. 1991. *The folk art of Japanese country cooking: A traditional diet for today's world*. Translated by Emily Busch. Berkeley, California: North Atlantic Books. xii + 270 p. Illust. Glossary and index of Japanese words. Recipe index. 26 x 20 cm.

• **Summary:** This is a remarkable book by a remarkable man, with many deep insights into both traditional and modern cultures in Japan and the USA; it gives a unique, authentic view of Japanese culture, and makes liberal use of the Japanese names for things, such as foods, utensils, techniques, houses, etc. He uses the Japanese words first, then explains what they mean (in parentheses) in English. Thus the book makes it easy and enjoyable to learn Japanese food-related words.

Moreover, the book is brimming with interesting information about traditional soyfoods in Japan.

The author was born in 1950 in Akita, capital of Akita prefecture, in northeastern Japan. Starting as a young boy, he studied Aikido with the founder, Morihei Ueshiba (1883-1969), as a live-in student in the small town of Iwama, in Ibaragi [Ibaraki] prefecture. He was curator of the Lake Ogawara Folk Art Museum, in Aomori prefecture, northeastern Japan, where he worked for about 4 years and

learned much of the most interesting tradition, history and other information in this book. Since 1977 he has been living in Denver, Colorado.

Contents: Preface. Foreword. 1. Introduction. 2. The background of country cooking—Folk art and custom. 3. The background of Japanese staple foods. 4. The background of country cooking—Basic preparation. 5. Country meals. Closing. Lake Ogawara Folk Art Museum (*Ogawara Minzoku Hakubutsukan*), located in Furumagi, Misawa City, Aomori prefecture. Founded by Mr. Yukio Sugimoto. Officially opened 29 Aug. 1961. Displays over 15,000 pieces of folk arts and crafts.

Agé (deep-fried tofu puffs, p. 96, 156, 190, 212, 215).

Edamame (green soybeans, p. 49-50). In and around his home town, Aug. 15 was too early for harvesting fruits, so they celebrated *mame meigetsu* on Sept. 15. The main food offered at this festival was *eda mame* (green soybeans) along with boiled chestnuts, other fruits, and sweet potatoes. The name of the festival is derived from the word *mame*, which means “bean.” In other areas the festival might be called *kuri meigetsu* (“chestnut full-moon”) or *imo meigetsu* (“sweet potato full-moon”)—depending on the main crop produced. All of the various crops harvested were offered to the moon.

Concerning soybean oil (p. 73): The section titled “Abura—Oils” states: In the Lake Ogawara Folk Art Museum an antique wooden tool (*abura shibori*, see photo) used for extracting oil is on display. The seed or food “to be pressed was placed between two pieces of wood and wedges were hammered into place with a big wooden mallet, driving the pieces together.

“In the Lake Ogawara area this method was used to make rapeseed oil, a popular cooking ingredient.” Clearly, the oil was produced in small quantities. “The traditional Japanese farmer was never able to produce enough oil for deep-frying foods.”

“There are many sources for natural oils in Japan. From sesame seeds we obtain *goma abura*, from Japanese nutmeg we obtain *kaya abura*, from corn we obtain *kimi abura*, from peanuts we obtain *rakkasei abura*, and from soybeans we obtain *daizu abura*.”

Concerning yuba: Although very healthful, yuba (dried soymilk film) is not as popular as most other Japanese soy products. “Tofu is made by bringing soybean ‘milk’ to a boil. As it boils, a thick film forms on the surface. This film is picked up on a cloth and laid out to dry. The resulting food is yuba.

“I have served yuba to people visiting from Japan and had them ask me what it was.” Yuba is popular in China and parts of southern Asia. It can be eaten fresh or dried. “Yuba is available in Oriental markets in the United States, but chemicals have usually been added during production.” A photo shows various dried yuba sheets and dried yuba sticks on a shallow, round, woven Japanese tray (p. 92).

Tofu (“soybean cake”), yuba (“soybean film”) and natto

(“fermented soybeans”) are all examples of soybean products (*daizu seihin*) (p. 139).

In the section on *Nimono*—“Poached dishes” is a recipe for yuba and kikurage (“Soak 2 oz. yuba and cut into 1-inch pieces,” p. 186).

Concerning *tonyu* (soymilk): It is mentioned only in the recipe for homemade tofu—using “2 cups *daizu* (soybeans) and ½ teaspoon nigari (coagulant)” (p. 142-43). Address: Former owner and head chef, Domo restaurant, Denver, Colorado. Founder and chief instructor Nippon Kan Aikido and Cultural Center, Denver, Colorado.

1400. Homma, Gaku. 1991. Natto (Document part I). In: Gaku Homma. 1991. *The Folk Art of Japanese Country Cooking: A Traditional Diet for Today’s World*. Translated by Emily Busch. Berkeley, California: North Atlantic Books. xii + 270 p.

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This record will focus on natto, which originated in Japan in the northeastern provinces (*Tohoku Chiho*) where the author lived.

In the index (p. 276), under “Soybean products (*daizu seihin*),” he defines three different types of natto: (1) Fermented soybeans (natto). (2) Slightly crushed natto (*hikiwari natto*). (3) Whole bean natto (*tsubu natto*). He notes that natto is discussed mainly on page 139.

In Chapter 3, “The background of Japanese staple foods,” in the section titled “Products used daily” (p. 94-100) is a subsection on “Natto—Fermented soybeans” (p. 97): “*Natto* is a very popular item on the Japanese breakfast table, but either you love it or you hate it; there is no middle ground. *Natto* is boiled soybeans that have been fermented by introducing the natto fungus [sic, natto bacterium, *Bacillus subtilis*]. Open a package of natto and the first thing to hit you is a very strange aroma. If you stir it, it becomes sticky. Someone watching this might say ‘yech.’ The translator of this book, Emily, is one of these people. Although she has lived in Japan and traveled extensively in Southeast Asia, she says ‘Natto is not for me.’

“Like the tofu peddler, the natto peddler came every morning. Now natto is available throughout Japan, but in the past, because of the growing conditions needed to produce it, many people had not eaten natto in southern Japan. Some of the visitors I have had at Nippon Kan, especially the young [Japanese] visitors who lived south of Osaka, had never

tasted natto.

“The weather in northern Japan is favorable for the natto fungus [sic]. Traditionally it was common for the farmers to make their own natto at home. I have tasted homemade natto from many different parts of Japan. Like most traditional foods, the taste and texture varies depending on the location and the family recipe.

“The first natto was discovered, it is thought, when soybeans stored for safekeeping became contaminated with water and created the appropriate environment for the natto fungus [sic]. Historically, many Japanese foods were discovered accidentally, such as in the course of storing or preserving foods.

“Since its initial discovery, the process has been isolated and developed in a controlled procedure.

“To eat natto, pour it from its container into a bowl and stir vigorously with chopsticks until it turns sticky. Then add miso or tamari and shoyu or umeboshi (pickled plums) to suit your taste. Spoon it over rice and eat. Although some people may not agree, I find it tasty.

“I met a very old woman in Denver [Colorado, USA] who was a wonderful traditional Japanese cook. She knew all of the techniques for making homemade sake, natto, tofu, umeboshi and tsukemono—everything in her kitchen was homemade. Sometimes this old woman would make natto and bring it to my home. It did not taste like the natto available in grocery stores. She fermented the soybeans in a styrofoam cup using plastic bread wrappers for a cover. She then wrapped the cups in layers of crumpled newspaper as insulation to keep them warm. So you see, traditional Japanese methods can have a place in modern America.”

In Chapter 5, “Country meals,” the section titled “Breakfast (*Choshoku*)” (p. 120-58) notes (p. 121-22): “The most simple breakfast includes *ichihan*, *ichiju*, and *issai*, which means one bowl of rice, one bowl of soup, and one side dish. This simple breakfast is served during religious training, eaten for four or five days consecutively before a fast, or eaten to change one’s diet or to lose weight.

“Prior to a fast, this meal is served in less and less quantity until the first day of the fast when *okayu* [rice porridge] is served... Traditionally, the *ichihan* or *meshi* (cooking rice) used for the breakfast meal is brown rice or barley or 60% white rice mixed with 40% barley. The *ichiju* is either *kombu*- or *shiitake*-based miso soup or a clear soup. The *misoshiru* (miso soup) contains a good balance of *tofu* and vegetables. There are many *issai* (called *okazu*) but they can be divided into the following basic categories: *tsukemono* (a variety of vegetables pickled with *miso*, salt, *shoyu*, or *nuka* (rice bran)); *ohitashi* (a variety of vegetables boiled quickly and flavored with *shoyu*); *daizu seihin* (*tofu*, fried *tofu* cutlets, grilled *tofu*, *natto* and other soybean products); *yakimono* (fish grilled either plain or marinated in *shoyu*, *miso*, *sakekasu* {rice wine lees}, or *nuka*); and *jobina* (a variety of dishes prepared and stored in the refrigerator to

be eaten anytime).

“One or more side dishes are selected from these categories; you don’t eat them all in one meal! Every morning you can arrange a new combination. Interestingly, as you increase the number of side dishes the portions of each decrease, so that you are always serving the same amount of food...

“Long ago Japanese people did not eat sitting around large tables. When sitting around the *irori* [sunken fireplace], a small tray was placed on the right side of each person. On each tray was a small side dish plate... After the meal, warm water was poured into their rice bowl and they used their chopsticks to clean it. After a sip of the water was taken, it was poured into the soup bowl, swirled around, sipped again, poured into the side dish plate, swirled and drunk... No washing required! We can conclude from this that the foods being eaten at the time were not oily, as the dishes could be easily cleaned with hot water.” Note: This may well be the origin of the Zen *oryoki* (nested eating bowls and chopsticks wrapped in white cloth) and its ritual.

Also in Chapter 5, under “Breakfast,” is a section on “*Daizu seihin*—Soybean products,” which includes a subsection on “Natto—Fermented soybeans” (p. 139): *Natto* is a very popular breakfast food made by stuffing boiled white [yellow] soybeans into a *tsuto* (casing made from rice straw) and leaving them to sit in a warm, darkened room. Before they are stored, a natural natto fungus [sic, bacterium] is introduced to start the fermentation process. The result is *natto*, which has a sticky ‘goeey’ texture and a pungent odor. Most Americans in my experience turn their noses up at the sight (and smell) of *natto*. Continued. Address: Former owner and head chef, Domo restaurant, Denver, Colorado. Founder and chief instructor Nippon Kan Aikido and Cultural Center, Denver, Colorado.

1401. Homma, Gaku. 1991. Natto (Document part II). In: Gaku Homma. 1991. *The Folk Art of Japanese Country Cooking: A Traditional Diet for Today’s World*. Translated by Emily Busch. Berkeley, California: North Atlantic Books. xii + 270 p.

• **Summary:** Continued (p. 139). “When making *natto*, the mixing bowl needs to be completely clean and free from any traces of salt. The natto fungus [sic, bacterium] is easily destroyed by salt. Salt is used to preserve most Japanese foods but *natto* is completely opposite.

“There are two kinds of *natto*. The first is called *tsubu* and is made from whole soybeans. The second is called *hikiwari* and is made from slightly crushed soybeans.

“Commercially made *natto* can be found in the frozen section of your local Oriental market for about one dollar. There are many different brands to choose from. Defrost the *natto* to room temperature before eating. Making *natto* from scratch involves a fairly complicated procedure. This book will concentrate on how to enjoy commercially produced

*natto*.

A sidebar across the bottom of page 139 is titled “How to eat natto:” “1 package natto (*tsubu* or *hikiwari*).

“Suggested garnishes include chopped scallion, cilantro, parsley, trefoil, seaweed, Japanese hot mustard, seven-taste pepper [*shichimi togarashi*], and ginger.

“A. If frozen, defrost natto at room temperature. Remove from package and put in a bowl. Stir vigorously with chopsticks until sticky. Fold in one or two types of garnishes. 1 teaspoon each, and stir vigorously.

“B. Choose from 1 teaspoon shoyu, 2 or 3 pinches of salt, or 1 teaspoon miso. Add and stir again.

C. If you like it spicy, add Japanese hot mustard, seven-taste pepper, or thin matchstick slivers of ginger to taste. Other garnishes include soaked *sukikombu* [sliced dried Laminaria kelp soaked and dried in thin sheets] and *funori* (floating seaweed; [*Gloiopeltis furcata*]).

“Follow steps A, B, and C just before meal time.

“D. Serve with a bowl or warm white rice. Place about 1 teaspoon of *natto* onto your rice and eat them together. The chopsticks used for serving natto are separate from your own chopsticks because the natto is so sticky. Try not to touch your own chopsticks to the natto; touch the rice only. If your chopsticks do touch the natto they will become slippery and other foods will tend to slip. Another method is to use the *nori* (dried strips of [paper-thin] seaweed) to pick up the natto and rice. Place a 2-inch square of *nori* on top of the natto and with your chopsticks scoop up a bite of natto and rice wrapped in *nori*. This method is the least sticky.”

On page 170 is a recipe for Natto soba, in which 3 oz. of natto, stirred until sticky, is used in place of grated Chinese yam in Tororo soba. *Soba* is the Japanese word for “buckwheat noodles.” Address: Former owner and head chef, Domo restaurant, Denver, Colorado. Founder and chief instructor Nippon Kan Aikido and Cultural Center, Denver, Colorado.

1402. Passmore, Jacki. 1991. *The encyclopedia of East Asian food and cooking* (Document part II). New York, NY: William Morrow. 320 p. [44 ref]

• **Summary:** Continued from p. 153: Korean bean paste: See Dhwen jang. Koshi-an (Japan): See Azuki beans (an). Koya tofu (Japan): See Bean curd, freeze-dried [sic].

Kuzu (Japan): See Flours and thickeners. Lentil (*Lens esculenta*): Red lentil, Red mung beans.

Light soy sauce: See Soy sauce.

Lu soy (lo shui, China): See soy sauce.

Maltose: Made by fermenting germinated grains of barley. When used to glaze foods, may have soy sauce and red food coloring added. Also known as: Malt sugar, [barley malt syrup].

“Ma-po” dofu [Mabo-dofu]: See beef.

Mean see jiang [mian shi jiang] (min see jiang, China): See Bean pastes and sauces.



Mein jin pau [mien jin pau] (China): See Gluten.

Mianjin (China): Gluten.

Mien see (mien-si [mian shi], China): See Bean pastes and sauces.

Miso (Japan): (1) Hatcho-miso. (2) Inaka miso or Sendai miso. Also known as Red miso. (3) Shinshu miso. (4) Shiro miso.

Mochi. Monosodium glutamate. Also known as: Mei jing (China); aji-no-moto (Japan); servuk perasa (Malaysia); ve tsin (Vietnam), M.S.G., taste essence, taste powder.

Moyashi (Japan): See Bean sprout.

Mung bean. Also known as moong ke dal (India); kacang djong, kacang eedjo [hijau, katjang idjo] (Indonesia); kacang hiau (Malaysia); tau ngok (Thailand); dau xanh (Vietnam); green gram.

Nama-age (nah-mah ah-geh, Japan): See Bean curd, deep fried.

Nama fu (Japan): Raw / uncooked wheat gluten.

Natto (Japan). See soybean.

Noodles: (1) Bean curd noodles (China). Also known as Soy noodles, soy vermicelli.

Oils and fats: Soybean oil. (2) Bean curd skin noodles (China) [yuba noodles].

Peanut (with many foreign names and recipes).

Preserved black beans: See Fermented black beans.

Pressed bean curd: See Bean curd (pressed).

Red bean paste, sweet: "An important ingredient in Chinese and Japanese cooking, sweet red bean paste is made by boiling the red azuki bean and mashing it to a paste with lard or oil, then cooking it until it is fairly dry or thick. In Japan, red bean paste is made in two textures: the smooth purée is koshi-an and the chunky version, with the beans only partly crushed, is tsbushi-an. It is a filling for cakes and sweet buns, and is used in several desserts." Also known as hong dow sar (China), an (Japan). Contains a recipe for Sweet red bean paste.

Red rice: See Fermented red rice.

Rice: Many type of glutinous and non-glutinous.

Rolled bean curd: See Bean curd sticks [dried yuba].

Seaweed: Many different types. Seaweed gelatin or Seaweed jelly: See agar agar.

Sendai miso (Japan): See miso.

Sesame seed: Black sesame seed, sesame oil, sesame paste, white sesame seed.

Shinshu miso (Japan). Shui doufu (China): See bean curd (silk). Silk bean curd: See Bean curd (silk).

Soybean (*Glycine max*): (1) Black soybeans. (2) Fresh soybeans [edamame]. (3) Yellow soybeans. Soybean cheese: See Bean curd, fermented [fermented tofu]. Soybean condiment: See Bean pastes and sauces. Soybean milk. Also known as tau cheing, tau ni (China). With homemade soymilk recipe. Soybean noodle: See Noodles, bean curd. Soybean oil: See fats and oils. Soybean paste: See Bean pastes and sauces. Soybean sprout: See bean sprout. Soy

flour: See Flours and thickeners.

Soy sauce: "An ancient seasoning, first used in China more than 3,000 years ago. Known in its original form as *shih*, it was a thin salty liquid in which floated fragments of fermented soybeans." "Soy sauce is to Chinese and Japanese cooking what the pungent, salty fish sauce known as nam pla or nuoc mam is to Thailand and Vietnam respectively." (1) Dark soy sauce. Also known as jang yau, see yau (China); koikuchi shoyu, tamari (Japan), kecap pekat (Malaysia); mushroom soy. (2) Light soy sauce: Thinner, saltier, and lighter in color and flavor. It is used in cooking where its light color will not spoil the color of the ingredients. Also known as sang chau, see yau (China), shoyu, usukuchi shoyu (Japan), kecap cair (Malaysia), toyo (Philippines), nam siew (Thailand), xi dau (Vietnam), thin soy sauce. (3) "Lu soy (China) is a 'master sauce' based on soy sauce with sugar, ginger, and five-spice, It is used for simmering poultry and other meats to give a rich flavor and to color the food a deep brown. Also known as lu shui (China)."

Soy sauce, sweet and salty: (1) "Kecap asin (Indonesia) is a thick, salty, dark soy-based sauce used to impart a strong color and flavor. Its sweet counterpart is *kecap manis*. It is similar to, but thicker than, several dark soy sauces used in Chinese cooking." (2) Kecap hitam (Malaysia) is a sweet dark soy sauce. Slightly less spicy than kecap manis. (3) Kecap manis (Indonesia) is a sweet, dark, thick, aromatic soy sauce, especially widely used with satay. "It is similar to, though finer in flavor than, Chinese sweet soy sauce" [tian mian jiang]. Also known as kecap bentang manis (Indonesia); sweet soy sauce. (4) "Sweet soy sauce (China) is a dark, sweet sauce combining soy sauce, sugar, and malt sugar. Its distinctive malt-like taste goes well as a dip for fried snacks, poultry, and seafood." It appears frequently on the table in homes and restaurants in Fukien province, opposite Taiwan on the coast of south-eastern China. For a recipe, see Sweet soy sauce pork (p. 230). Note: This is not generally a commercial product. (5) Tim cheong (Malaysia) is a thick, sweet, black soy sauce, similar to that used in China. In Malaysia it is served with poh pia. Its flavor is closer to that of kecap hitam than to kecap manis.

Sprouts, soybean. See Bean sprout, soybean. Sushi (describes many types, with recipes). Sweet bean paste or Sweet bean sauce: See Bean pastes and sauces.

Taho (Philippine bean curd brains). Tahoe (Indonesia or Malaysia, fermented bean curd). Tahu (Malaysia bean curd). Ta hua (Malaysia bean curd). Tahure (Philippine bean curd).

Tamari (Japan): See soy sauce. Taucheo (Malaysia or Singapore, bean pastes and sauces). Tauge (Indonesia bean sprout). Tauhu kao (Thailand bean curd). Tauhu kuning (Indonesia and Malaysia bean curd pressed). Tauhu leong (Thailand bean curd, pressed). Tauhu tod (Thailand bean curd, fried). Taukwa (Indonesia and Malaysia bean curd pressed). Tau sa (Malaysia bean paste and sauces). Tausi (Philippines, bean curd products [sic, fermented black

soybeans], fermented).

Tempe (Indonesia, Malaysia): Fermented soybean cake [tempeh]. Oncom [Ontjom]. Tokwa (Philippine bean curd pressed).

Tosa soy sauce (Japan): The classic sashimi accompaniment. Recipe given.

Tsukemono: Takuan, umeboshi.

Usu-age (Japan): See Bean curd (fried) purses.

Winged bean. Yuba (Japan).

Brief biography: "For more than twenty years she has been professionally involved with Asian food as a writer, teacher, publicist, researcher, consultant, and, of course, cook. She has traveled extensively in Asia and lived in Hong Kong for more than ten years, working as a food writer on a number of newspapers and magazines, which led to a career as a food consultant. Her most recent book, *Asia the Beautiful Cookbook* was listed by *Publishers Weekly* as one of the best books of 1987." Address: Author of several books on Asian cuisine.

1403. Shufu-no tomo. 1991. Anzen shokuhin no hon: Munôyaku, mutenka no honmono shokuhin otoriyose gaido [The book of safe foods: A guide for getting real foods without agricultural chemical or additives]. Tokyo: Shufu-no-tomo-sha. 144 p. Illust. 26 cm. Tokubetsu henshû (Special edition). Shufu-no-tomo Seikatsu Series. 26 cm. [Jap]

• **Summary:** This beautiful book is about Japanese natural foods, organically grown without agricultural chemicals and processed without chemical additives. It is packed with color photos and descriptions of the products, the people and companies that make them, and the places where they are made. The name, address, and phone number of each company is included. Miso (p. 16-20). Shoyu (p. 21-27). Natto and tofu (p. 76-78).

Amazake (p. 16-17): Koji-ya Saburouemon, Nakamura 2-29-8, Nerima-ku, Tokyo, Japan. Phone: 03-3999-2276. 100 years old, 6th generation.

Miso & Shoyu (p. 18): Sendai Miso Shoyu, Kojo 1-5-1, Wakabayashi-ku, Sendai-shi, Miyagi-ken 982, Japan. Phone: 022-286-3151.

Miso & tamari (p. 19): Nakamura Jozo, Tatsuno-cho 1536, Yokkaichi-shi, Mie-ken 510, Japan. Phone: 0593-26-0456. Started 70 years ago. 3rd generation. About 15 years ago started to make naturally fermented soy products.

Miso (incl. barley miso; p. 20): Shirouza Shoten, Meihama 3-3-27, Nishi-ku, Fukuoka-shi, Fukuoka-ken 819, Japan. Phone: 092-881-0413.

Shoyu made with whole soybeans (p. 21): Kikkogo Shoyu Kondo Shoyu Moto, Yamada 733, Itsukaichi-machi, Nishitama-gun, Tokyo 190-01, Japan. Phone: 0425-95-1212.

Shoyu (p. 22-23): Kadocho, Kita-machi 7, Yuasa-machi, Arita-gun, Wakayama-ken 643, Japan. Phone: 0737-62-2035. 5th generation.

Shoyu (p. 24): Yamaki Shoyu, Kotobuki 3-3-16,

Honsho-shi, Saitama-ken 367, Japan. Phone: 0495-24-6161.

Unpasteurized miso, and shoyu (p. 25): Shoku Seikatsu Kenkyu-kai, Miroku-ji 83, Fujisawa-shi, Kanagawa-ken 251, Japan. Phone: 0466-22-0635. Started in about 1970.

Shoyu, amazake base, koji, miso (p. 26): Inoue Shoten (Igeta Shoyu brand), Owari-machi 57, Kitakyo, Nara-shi 630, Japan. Phone: 092-741-5360. 4th generation. Started during the Genji era (1864-65).

Shoyu (p. 27): Jokyu, Daimyo 1-12-15, Chuo-ku, Fukuoka-shi 810, Japan. Phone: 092-741-5360. Started 135 years ago.

Natto (p. 76): Kuroishi Natto, Fukuroi 1-74, Kuroishi-shi, Aomori-ken 036-03, Japan. Phone: 0172-52-3958.

Started 60 years ago.

Natto (p. 77): Shojiki Mura, Nishitakao 5-237, Kitamoto-shi, Saitama-ken 364, Japan. Phone: 0120-421351. A relatively new company.

Tofu (p. 78): Kurihara Shoten, Endo 2022, Fujisawa-shi, Kanagawa-ken 252, Japan. Started in about 1977. Address: Tokyo.

1404. Yokotsuka, Tamotsu. 1991. Proteinaceous fermented foods and condiments prepared with koji molds. In: Dilip K. Arora, K.G. Mukerji, and E.H. Marth, eds. 1991. Handbook of Applied Mycology. Vol. 3: Foods and Feeds. New York, NY: Marcel Dekker, Inc. x + 621 p. See p. 329-73. Chap. 11. [118 ref]

• **Summary:** Contains a great deal of very interesting information. Contents: 1. Introduction. 2. Fermented soybean foods in East and Southeast Asia: A. Douchi (China), Hamanatto (Japan), and in-yu (Taiwan). B. Shuidouchi (Shandong province, China), thua-nao (Thailand), kinema (Nepal), and natto (itohiki natto) (Japan). C. Tempe [Tempeh] and Oncom [Onchom] (Indonesia) (Making soybean tempe, volatile flavor of tempe, chemical composition and nutritional value of tempe, tempe bongkrek). D. Fermented tou-fu (soybean curd) products: Sufu (China and Taiwan), Tofuyo (Okinawa, Japan).

3. Fermented salty condiments in a slurry or paste made from soybeans and cereals: A. Doujiang (touchiang) (China) and Tauco [taucho] (Southeast Asia). B. Doubanjiang (Toupanchiang). C. Tianmianjiang (Tienmienchiang). D. Gochujiang and Doenjang (Korea). E. Hishio (Japan). F. Miso (Japan) (Production and consumption of miso, making rice miso and barley miso).

4. Fermented salty liquid condiments made from soybeans and cereals: A. Japanese shoyu (Manufacture of koikuchi and usukuchi shoyu, manufacture of tamari shoyu). B. Soy sauce produced in east and southeast Asian countries other than Japan (Korea, Taiwan, Hong Kong, Singapore, Malaysia, Indonesia, Thailand, People's Republic of China {the process, acid hydrolysis, was illegal until recently}, chijhi or whole soybean soy sauce still made in the basins of the Zhujiang {Pearl} River and the Huanghe {Yellow}

River).

5. Biochemistry involved in shoyu and miso manufacture: A. Selection of raw materials. B. Contribution of improved cooking methods of raw materials to increase the enzymatic protein digestibility. C. Selection and improvement of koji molds. D. Improvement in koji making. E. Microbial and chemical control of salty mash fermentation. F. Flavor evaluation of koikuchi shoyu. G. Stability of color of pasteurized shoyu. H. Nutritional concern about shoyu and miso (salt content). Safety of koji molds and shoyu (aflatoxins).

#### 6. Conclusion.

Tables show: (1) Chemical composition of kinema, thua-nao, and douchi. (2) Changes in nitrogenous compounds during natto fermentation. (3) Changes of nitrogen compounds in sufu making. (4) Constituents of some types of miso. (5) Chemical composition of various kinds of genuine fermented shoyu in Japan. (6) Effect of cooking conditions of thoroughly moistened defatted soybean grits on the enzymatic digestibility of protein. (7) Differences between *A. oryzae* and *A. sojae* used for shoyu fermentation. (8) Proteinases produced by *Aspergillus sojae*. (9) Enzyme composition of koji as influenced by the difference of material. (10) Various metabolic patterns by lactobacilli in shoyu mash. (11) Digestibilities of protein in shoyu, miso, natto, and tempe fermentations. (12) Results of quantitative analysis of flavor constituents in koikuchi shoyu.

Figures show: (1) Flow sheet of tempe making. (2) Flow diagram of sufu making from 1 kg soybeans (with all quantities of ingredients, temperatures, and times). (3) Flow diagram of rice-miso fermentation from 1,000 kg soybeans and 600 kg milled rice. (4) Flow diagram of koikuchi shoyu fermentation from 330 kg defatted soybean meal (or 400 kg whole soybeans) and 340 kg wheat kernels. (5) Flow diagram of tamari-shoyu fermentation from 800 kg defatted soybeans, 346 kg wheat, 20 kg roasted barley flour, and 439 kg NaCl. (6) Microflora changes in shoyu mash fermentation. (7) Classification of *Aspergilli*. (8) Fermented foods and condiments made from soybeans mixed with or without cereal grains or flour.

Hama-natto in Japan (p. 332): The Taiho Laws, which took effect in 701, mention an office in Japan's imperial court that dealt with several fermented soyfoods including "douchi [2 Chinese characters given] or kuki (1 Cc): in Japanese, miso and jiang (1 Cc) or hishio (1 Cc)..." "The method of preparing salted and unsalted douchi [fermented black soybeans] is described in the book *Yoshufushi* (1686) and elsewhere. According to the oldest record about douchi in Korea, in 683, the product apparently was not an important food commodity in that country.

Salted douchi [fermented black soybeans, which originated in China] appeared in Central Japan with names such as "Hama-natto, Daitokuji-natto, and others, and in Taiwan as *In-si*."

Concerning *shuidouchi* (*Chinese salted natto with minced ginger*, p. 332-35): This unusual product can be considered an intermediate form between *douchi* (salted fermented soybeans / fermented black soybeans) and the itohiki-natto family of foods; unlike *douchi* it is fermented with a *Bacillus* bacterium rather than with an *Aspergillus* mold, but unlike natto it is a salted product and has ginger added. To make *shuidouchi*: Boiled soybeans are naturally inoculated with *Bacillus subtilis* and incubated at high humidity and at 30-40°C. This preference for a high temperature may be why the *Chi-min yao-shu* (6th century China) recommended that, when making douchi [fermented black soybeans], the temperature during incubation be kept rather low. In Shandong, China, *shuidouchi* are made as follows: Clean, soak, and boil soybeans until soft. Place in a cloth bag and cover with straw, which is the best natural source of *B. subtilis*. After incubation for 1-2 days at 25-30°C the soybeans will be covered with viscous substances. Mix the sticky soybeans with minced ginger and salt, then pack tightly into jars, and age for one week. They are now ready to consume (See references 5 and 6). Address: Research Div., Kikkoman Corp., Noda City, Chiba prefecture, Japan.

1405. **Product Name:** [Soy Burger (With Tofu, Natto, Okara & Vegetables)].

**Foreign Name:** Soja-Burghetti.

**Manufacturer's Name:** Food for Freedom.

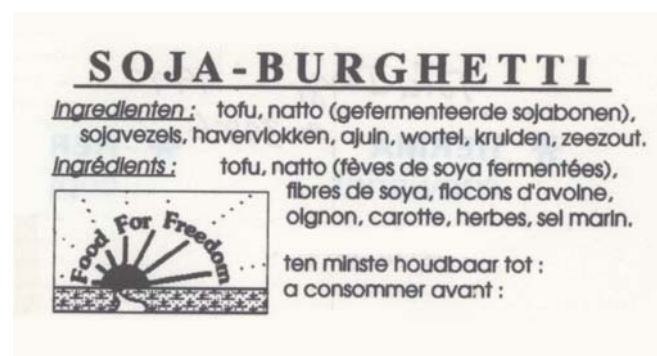
**Manufacturer's Address:** Nylense [Nijlense] Steenweg 72, B-2270 Herenthout, Belgium. Phone: 014 / 51 7237.

**Date of Introduction:** 1992. January.

**Ingredients:** Tofu, natto, soy fiber (fibres de soya), rolled oats, onion, carrot, herbs, sea salt.

**How Stored:** Refrigerated.

**New Product-Documentation:** Label and letter sent by



Lucio de Berti, owner of Food For Freedom. 1992. Jan. This tofu burger with 10% natto was introduced in Jan. 1992. It is sold in only 2 large shops without a label because it is still being test marketed.

Label. 4 by 2 inches. Black on white. In Dutch and French.

1406. *Toyo Shinpo* (*Soyfoods News*), 1992. Nattô mochi

ikaga? Kyôto-shi no Kita-bu Kyôkita-machi no meibutsu [How would you like some natto mochi? Its a special product of Kitamachi in northern Kyoto]. Feb. 21. p. 3. [Jap]

• **Summary:** A small photo shows that the natto is inside a piece of mochi.

1407. Honda, Chiyo; Nanba, Toyohiko; Asaoka, Osamu; Yumoto, Kuniko; Hayashi, Toshio; Ikegami, Sachie; Takai, Yuriko. 1992. [Modification of methods for determination of dietary fiber in raw and processed pulses]. *Shokuhin Eiseigaku Zasshi (J. of the Food Hygienic Society of Japan)*. 33(1):46-51. Feb. [17 ref. Jap; eng]\*

• **Summary:** Foods analyzed include white kidney beans, kintoki beans, and soybeans (whole dry raw, boiled, kinako, natto). Address: 1-5. Japan Medical Foods Association, 5-3-11, Maesawa, Higashikurume-shi, Tokyo 203, Japan.

1408. Kushi, Michio. 1992. Introduction to *Culinary Treasures of Japan*, by John and Jan Belleme. 16 p. Jan. Unpublished manuscript.

• **Summary:** This manuscript, which was published in a condensed form in the actual book, tells the story of Mitoku and their work to export traditional Japanese natural foods to the Western world. Michio Kushi was instrumental in getting Mr. Akiyoshi Kazama involved in this work. Mr. Kushi, who became a World Federalist after World War II, came to the U.S. in Nov. 1949 to study at Columbia University. He continuously sought ways of establishing world peace, and increasingly came to believe that a proper diet is the basis for health, happiness, and peace.

In April 1966 the author's wife, Aveline, opened a small store named Erewhon in Boston. Michio began to search for a Japanese source for foods that Erewhon would sell. He was introduced to Mr. Kazama (who lived in Tokyo) through a Japanese friend, Mr. Obayashi, who resided at that time in New York City. Michio felt that Mr. Kazama understood his desire for foods of high quality. So Mr. Kazama "began his search for food producers and manufacturers who were sincere and willing to supply the kind of quality we requested. I know that for him, at that time, it was a great gamble. It was also a painstaking and slow step-by-step process."

Mr. Kazama was born on 1 Feb. 1930 in Yamanashi prefecture. He graduated from Waseda University in Tokyo, then was selected to study business in the United States. After arriving in Chicago, Illinois, he was drafted by the U.S. government to serve in the American Army in Korea and in Japan from 1956 to 1958. Upon his return to Japan, he settled in Tokyo where he became an import agent for a German company dealing in optics and electronics. After the Kushis contacted him, he became involved in the emerging natural food business. [He founded a company named Mitoku. Mi = Michio. To = Tomoko (Aveline's given name in Japanese). Ku = Kushi].

In 1968 Mr. Kazama made his first shipment of Japanese natural foods to Erewhon; the order was worth \$3,000. The Kushis first met Mr. Kazama in Boston in 1970. Over the years, the volume of Mitoku's exports steadily grew, and expanded to Europe, Australia, and the Middle East. Today Mitoku ships its products to about 35 countries. Approximately 40% of Mitoku's exports go to America, 40% to Europe, and 20% to Australia and other regions. Annual sales are about \$10 million. Among the major suppliers are Sendai Miso Shoyu Co. Ltd., Hacho Miso Co. Ltd., Hagaromo Miso, Ltd., Hanamaruki Miso Co. Ltd, San Iku Foods Co. Ltd.

Distributors of Mitoku's products include the following: In the USA: Westbrae Natural Foods Inc., Great Eastern Sun Inc., U.S. Mills Inc., Tree of Life Inc., and Shojin Natural Foods (Hawaii). In Canada: Koyo Foods Inc., Flora Distributors Ltd., and Timbuktu. In Costa Rica: Distribuidora de Productos Macrobioticos S.A. In England: Sunwheel Foods Ltd, Clearspring Natural Grocer, Meridian Foods Ltd. In France: Celnat, Tama. In Belgium: Lima N.V. In the United Arab Emirates: Emirates Trading & Marketing Est. In South Africa: Key Health. In Austria: Naturkostladen, Lebenszeichen. In Switzerland: S'lotusbluemli, Terrasana, Futonhaus. In Sweden: Kung Markatta. In Norway: Alternative Import. In Finland: Makro Bios. In Portugal: Armazens Da Matinha. In Spain: Kunga. In Italy: La Finestra Sul Cielo, Probios S.R.L., Dalla Terra al Cielo, Solo Natura. In Israel: Tivoli Ltd. In Australia: Pureharvest. In New Zealand: Enso. In Singapore: Nature's Best. In Yugoslavia: General Export. In Japan: Seibu Department Stores Ltd., Tokyu Department Stores Ltd. Among the countries reached indirectly through trans-shipment are Hungary, reached through Austria, various South American countries reached through the United States, and other countries such as Poland, Czechoslovakia, Iceland, Andorra, Ireland and the Caribbean Islands.

As Mitoku developed its international operations, Mr. Kazama hired many students from Western countries, including Blake Rankin (USA), Ferro Ledvinka (Italy), Christopher Geoffrey Dawson (New Zealand, starting 1979), Robbie Swinnerton (England), Terrie Adams (USA), and Michelle Harbroun (France).

"For the past 10 years, Mitoku has echoed and supported the macrobiotic perspective with its motto 'Isshoku-Dogen.' These words, though they have been forgotten in the last few centuries by the very people in the health care field who should remember them well, mean literally 'medicine and food have the same source,' and can be translated as 'food *is* medicine.' This saying has been used and known as part of the ancestral heritage of wisdom transmitted from generation to generation for several thousand years in Oriental countries such as China, Korea and Japan.

"In an attempt to preserve Japanese traditions, Japan has instituted a 'Living Treasures' program granting official

recognition and support to [living masters in] various cultural areas such as theater, music, dance, sculpture, carpentry, weaving... and arts and crafts. Ironically, though, Japan has not granted the same official recognition to its traditional methods of food processing and production in spite of the fact that increasingly large numbers of people throughout the world are now appreciating traditionally processed Japanese food products and have become aware of their important health benefits. The Japanese traditional arts of producing miso, soysauce, tofu, natto, amazake, rice vinegar, sake, mirin, condiments and pickles as well as cooking methods and preparation are unique among the culinary practices of the world... These foods are also works of art... It is my hope and recommendation that official recognition and support be granted by the 'Living Treasures of Japan' to those who have dedicated their life to the traditional art of food production and processing in spite of the hardships and commercial disadvantages they are compelled to face in business competition and present-day economical conditions." Address: 62 Buckminster Rd., Brookline, Massachusetts 02146.

1409. GEM Cultures. 1992. Catalog [Mail order]. 30301 Sherwood Rd., Fort Bragg, CA 95437. 9 p. March. [4 ref]  
 • **Summary:** A new addition to the catalog is "Tofu form boxes" named "Total Tofu!" Each is made by a local woodworker in Mendocino County using American beech wood. The 8 by 5 by 3½-inch size is large enough to press 2 pounds of tofu. Included also is a 3 oz packet of natural nigari, 3 ounces of Terra Alba calcium sulfate, a double square of Grade 60 cheesecloth to line the box, and directions on how to make tofu and soymilk. Price of a Total Tofu kit, postpaid, is \$32.00. Address: Fort Bragg, California. Phone: 707-964-2922.

1410. Johnson, Lawrence A.; Myers, D.J.; Burden, D.J. 1992. Early uses of soy protein in the Far East, U.S. *INFORM (AOCS)* 3(3):282-88, 290. March. [54 ref]  
 • **Summary:** A nice history of the subject based on a review of the literature. Contents: Early history in East Asia (industrial uses, chiang and miso, natto, tempeh, soymilk, tofu, shoyu). Emergence of U.S. soybeans (early soybean mills, ADM, Glidden). Chemical understanding of soybean protein (major components/fractions). First industrial applications (oil and meal). Soy protein-based plastics (Henry Ford). Chemurgic movement (U.S. Regional Soybean Industrial Products Laboratory, Northern Regional Research Center, Glidden). Soy protein adhesives (I.F. Laucks). Paper coatings and sizings (Glidden). Soy fiber spinning (Ford, Azlon, Drackett). Other industrial uses. Address: Center for Crops Utilization Research, Iowa State Univ., Ames, Iowa 50111.

1411. *Toyo Shinpo (Soyfoods News)*, 1992. [Average

household expenditures for tofu, aburaage, natto and konnyaku in Japan in 1991 by region]. April 11. p. 2. [Jap]  
 • **Summary:** Average per household expenditures for various soyfoods; yen figures are not adjusted for inflation. The 11 regions (chihō) are: 1. Tokyo-to. 2. Hokkaido. 3. Tohoku Chiho 4. Kanto. 5. Hokuriku. 6. Tōkai. 7. Kinki. 8. Chūgoku. 9. Shikoku. 10. Kyushu. 11. Okinawa.

Average per household expenditures for tofu are highest in Shikoku (9,045 yen, up 22.9% from the previous year). They are 2nd highest in greater Tokyo (8,218 yen, up 3.8%). They are lowest in Hokuriku (6,835 yen, down 2.0%).

Average per household expenditures for aburaage and ganmodoki (deep fried tofu pouches and burgers) are highest in Hokuriku (5,772 yen, up 3.7% from the previous year). They are 2nd highest in Kinki (5,170 yen, up 10.5%). They are by far the lowest in Okinawa (701 yen, down 0.7%).

Average per household expenditures for natto are highest in Tohoku Chiho (the northeast prefectures) (4,709 yen, up 20.6% from the previous year). They are 2nd highest in Kanto (4,133 yen, up 13.1%). They are by far the lowest in Okinawa (923 yen, down 13.5%).

1412. Wilson, Lester A.; Murphy, Patricia A.; Gallagher, Paul. 1992. Soyfood product markets in Japan: U.S. Export opportunities. Ames, Iowa: MATRIC (Midwest Agribusiness Trade Research and Information Center). x + 64 p. April.  
 • **Summary:** Contents: Figures. Tables. Acknowledgments. Introduction. I. Soybean processing (by Wilson and Murphy). Food from soybeans: Soybean chemical composition, environmental influences on soybean composition. Soyfood manufacture: Soymilk, tofu, momen tofu, kinugoshi tofu, packed tofu, aseptically-packaged tofu, deep-fried tofu, kori tofu. Tofu-related research: Recent studies at Iowa State University, summary, future research. Other nonfermented soyfoods: Yuba, kinako, texturized soy protein foods. Fermented soyfoods: Miso, shoyu, natto, tempeh. Japanese Agricultural Standards (JAS). Identity preservation and transportation. U.S. soybean quality and the Japanese market: Grain quality, judging quality, potential new markets.

II. Japanese soyfood markets (by Gallagher). Demand and growth prospects: Consumption patterns, demand analysis, forecasts. The U.S. share of the food soybean market: Sources and uses, market share analysis, determinants of relative prices, prospects. Trade and trade barriers: Soybeans, processed products. Summary and recommendations.

Appendixes: A. Excerpts from specifications and standards of food additives, etc.—Manufacturing and storage of tofu. B. Excerpts from standards and certification systems in Japan. C. Additional agricultural standards for soybeans. References.

Table 2.1 shows soybean use for soyfood production in Japan; actual (1986) and projected (2000). Soybeans for tofu

are expected to increase from 524,000 to 609,700 tonnes. Soybeans for miso are expected to decrease from 156,000 to 101,600 tonnes. Soybeans for natto are expected to increase from 92,000 to 118,600 tonnes. Figures 2.1 to 2.4 show Japanese per capita consumption of tofu, natto, miso, and soy sauce from 1965 to 1988. Tofu: Japanese annual per capita consumption of tofu has risen since 1965, except that it fell during 1973-1977. In 1965 about 3.6 kg/capita of soybeans were used to make tofu, increasing to 4.4 kg/capita in 1988. If 1 kg of soybeans yields 2.8 kg of tofu, then per capita tofu consumption in 1988 was 12.32 kg or 27.1 lb.

Natto: Japanese annual per capita consumption of natto has risen steadily, from a little less than 0.4 kg in 1965 to 0.6 kg in about 1968, to 0.8 kg in 1988.

Miso: Japanese annual per capita consumption of miso fell from 8 kg in 1965 to about 5.4 kg in 1985, then it began to rise to about 5.7 kg in 1986.

Soy sauce: Japanese annual per capita consumption was about 12 liters in 1965. It fell to 11 liters in 1967, rose to 13 liters in 1973, then fell to 9.8 liters in 1985, after which it rose for 1 year. Address: 1-2. Prof. of Food Science and Human Nutrition; 3. Assoc. Prof. of Economics. All: Iowa State Univ. Phone: 515-294-0160.

1413. Sinclair, Valerie. 1992. Japanese cuisine is several settings. *New York Times*. May 10. p. NJ 13.

• **Summary:** This is a review of the Japanese restaurant Sukeroku (68 Route 23, corner of Pompton Ave., Little Falls, in upstate New York—near Utica, between Albany and Rochester). About four years ago a new owner added a karaoke bar to the sushi bar and tatami rooms. Some dishes illustrate well the contrast in textures so prized in Japan. For example “raw squid rings with chopped fermented [soy] beans (ika natto).”

1414. Bakker, Marco. 1992. Een verkenning naar de optimale omstandigheden voor de bereiding van natto [Scouting for the optimal conditions for the preparation of natto]. Netherlands: Landbouw Universiteit Wageningen. 80 leaves. May. 30 cm. [39 ref. Dut; eng]

• **Summary:** Pages 10-12 contain an English-language summary of the literature on natto and of this laboratory research. Address: Sectie Levensmiddelenchemie en -microbiologie, Vakgroep Levensmiddelen-technologie, Landbouw Universiteit Wageningen, Netherlands.

1415. van der Steen, Frans M.G. 1992. Re: Natto survey by Marco Bakker (student) written in Dutch, with English summary. Letter to William Shurtleff at Soyfoods Center, June 25. 1 p. Typed, with signature.

• **Summary:** “Dear Bill. After your quick answer on [sic, to] my letter, about the natto survey. I realised that I forgot to tell you that, except for the summary, the report is written in Dutch.

“I apologise for this mistake. If you need certain pages translated.

“The survey is written by Marco Bakker (student), and he was accompanied by M.J.R. Nout (lecturer). The last mentioned published about tempeh.

“As you will understand I had to make cost to photocopy (with permission) and to dispatch it to you. Is it possible to offer me, in return, information about natto?”

“Thank you very much, Sincerely.” Address: Tourslaan 35, 5627 KW Eindhoven, Holland.

1416. *Toyo Shinpo (Soyfoods News)*. 1992. Tōfu, aburaage, nattō, konnyaku noki nami ni fushin: Jisshitsu de zennen dōgetsu hi 0.5% no gensho [Consumption of tofu, aburaage, natto and konnyaku in Japan from 1976 to 1991: Decreased 0.5% from the same month last year]. July 21. p. 2. [Jap]

• **Summary:** Per household consumption of various soyfoods; yen figures are not adjusted for inflation. Tofu consumption rose from 85.73 cakes costing 5,020 yen in 1976, to 86.89 costing 6,047 yen in 1980, to a peak of 90.43 costing 6,761 yen in 1983, dropping to 88.48 costing 7,337 yen in 1985, down to 83.42 costing 7,323 in 1990, down to 78.76 costing 7,699 yen in 1991.

Consumption of aburagē and ganmo (deep-fried tofu pouches and burgers) rose from 2,950 yen in 1976, to 3,472 in 1980, to a local peak of 4,080 in 1984, dropping to 4,057 in 1985, down to 3,898 in 1990, then rising to a recent peak of 4,253 in 1991.

Natto consumption rose from 1,034 yen in 1976, to 1,289 in 1980, to 1,655 in 1985, to 2,532 in 1990, to an all-time peak of 2,532 yen in 1991.

1417. GEM Cultures. 1992. Catalog [Mail order]. 30301 Sherwood Rd., Fort Bragg, CA 95437. 9 p. Aug. [4 ref]

• **Summary:** This catalog celebrates the company’s 12th anniversary. The first section is titled “Powdered cultures for soycrafters.” On page 1: “Powdered Tempeh Starter, PTS: Tempeh is a delicious, Indonesian, cultured soyfood with a chewy texture. Whether your interest is in exotic foods, eating lower on the food chain for health, social or economic reasons, or cutting back on meat, cholesterol, or calorie consumption, tempeh fills the bill. A vegetarian source of Vitamin B-12, this versatile food can be fried in the traditional manner or baked, broiled, steamed, or barbecued. Easily cultured without special equipment, homemade tempeh tastes and smells wonderful, slices better, and costs far less than commercial tempeh.

“The tempeh mold, *Rhizopus oligosporus*, that binds the cooked soybeans together into a sliceable cake, is grown on an entirely vegetable medium. Mature spores are harvested and combined with sterile organic rice flour for easy and accurate measuring on every batch. Complete culture directions and recipes are included. One pound of dry soybeans prepared as directed will make 1 3/4 pounds of

tempeh. Preparation time—less than 2 hours. Incubation time—about 24 hours at 85 F (32 C). Kept cool and dry, PTS has at least a 6-month shelf life at full potency.

“Kit PTS, 11 gm, three 1-pound batches (makes 5+ pounds). \$2.50 each.

“Big PTS, 35 gm, ten 1-pound batches (makes 18 pounds). \$4.00 each.

“Half Kilo PTS, 500 gm, packaged in bulk. \$35.00 each.

“Full Kilo PTS, 1000 gm, packaged in bulk. \$65.00 each.

“Powdered Natto Starter: Called *Natto* in Japan and *Thau-nao* in Thailand this cultured soyfood has a strong, somewhat persistent, unique flavor. The bacteria, *Bacillus subtilis* var *natto*, that culture the cooked soybeans make a sticky, viscous polymer during the 6-12 hours of incubation which creates wispy threads evident when the cultured soybeans are pulled apart. A good source of protein, this robust soyfood adds zest to any grain or noodle dish, soup or sandwich. A little goes a long way, so what is not intended for use in a day or two may be easily frozen.

“Natto Starter Kit: This packet contains complete culture directions, recipes, and enough spore to start 3 recipes of natto, each making 5 cups or 1½ pounds.

“Bulk Natto Starter: A concentrated spore preparation, this vial has sufficient spore to start 48 pounds of dry soybeans. Prepared according to the included directions it will therefore make about 86 pounds of natto.

“Natto Starter Kit: Makes 4½ pounds. \$2.50.

“Commercial Natto Starter: Makes 86 pounds. \$10.00.”

Also: Amazake, miso, shoyu, and tamari starters from Japan. Five types of *tane koji* (koji starter) imported from Japan. Commercial miso and shoyu koji spore packets. Organic light rice koji. Natural salts for curding tofu: Natural nigari, Terra Alba calcium sulfate. Self-renewing cultures: Kombucha tea fungus. Fresh sourdough. Seed miso. Fresh fil mjolk, fresh viili, fresh kefir curds. Cookbooks with culture. Sea vegetables from the Mendocino Sea Vegetable Co. Kitchen culture items. Address: Fort Bragg, California. Phone: 707-964-2922.

1418. Reid, T.R. 1992. Japan’s ‘first’ star in space: Shuttle crew member fascinates home crowd. *Washington Post*. Sept. 19. p. A1.

• **Summary:** “Tokyo—News Flash from Florida: NASA has nixed fermented soybean paste” [natto]. The Japanese have taken a strong interest in Mamoru Mohri, age 44, a Japanese who is now aboard the space shuttle Endeavour, orbiting the Earth. This is a bit surprising since he is not the first Japanese in space; Toyohiro Akiyama rode in a Soviet rocket to the Mir space station in Dec. 1990.

Before takeoff there were some stories about Mohri’s efforts to take common Japanese items on board. “Mohri had hoped to bring along some snacks made of *natto*, a stringy, smelly dark paste of fermented soybean. Evidently

fearing that loose strands floating weightlessly around the crew quarters might cause international tension, NASA nixed natto. To soften the blow, NASA agreed to let Mohri bring along some *umeboshi*, a spicy pickled plum.” Address: Washington Post Foreign Source, Tokyo.

1419. *Toyo Shinpo (Soyfoods News)*, 1992. Nattô no itohikisei teikazai oyobi kore o mochiiru itohikisei no nai nattô no seizôhō: Tokkyo shutsugan shōroku. Kikkōman (K.K.) ga shutsugan [Making the agent that reduces the sticky properties of natto and making natto that is less sticky: Details of the patent application. Kikkōman was the applicant]. Oct. 1. p. 12. [Jap]

1420. Shannon, Dennis A. 1992. Work with soybeans in Nigeria (Interview). *SoyaScan Notes*. Oct. 9. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Dennis worked as a soybean breeder with IITA in Nigeria, where the center of soybean production is currently Benue state in south central Nigeria. Benue state has been growing soybeans since the end of the 1930s, when the variety Malayan was introduced. Soybeans were seen as an export crop until the Biafran war; at that time exports ceased but curiously production continued. When he was a graduate student in 1980-81 doing his research in Nigeria, he found soybeans being grown in Benue state. Yet farmers don’t eat the soybeans. Some farmers told him: “They used to tell us that soybeans are good to eat but they would also tell us that they are poison.” So the farmers sold the soybeans to Hausa traders who would ship them to Kafanchan, in Kaduna state, where they were made into dawa-dawa (*dadawa*, *iru*). Kafanchan is the center of soybean *dadawa* production. Hendrick C. Knipscheer had a Nigerian graduate student who did a survey on dawa-dawa; he found that some of it was even making its way into Niger and Chad. A Peace Corps Volunteer named Woodworth worked with Ken Dashiell at IITA in 1988-89 doing surveys on soybeans. He found that quite a few people are eating soybeans now in Benue state, either as dawa-dawa or as a partial substitute for cowpea in *moimoi* (steamed cowpea flour) or *akara* (dumplings). The soybeans were less expensive and more nutritious than cowpeas. When he arrived in Nigeria in the mid-1980s, there was almost no soybean production in western Nigeria. Increasingly, soybeans in Nigeria are being used as food.

In Nigeria IITA developed a cropping system named “alley cropping” as a way of maintaining the productivity of the soil, improving soil conservation, and reducing erosion. You plant hedgerows of fast-growing trees (typically *Leucena* species) about 12 feet apart, then before planting crops between the rows you prune the trees and spread the leaves on the ground to provide nitrogen and organic matter. Between the rows you can plant maize, cassava, soybeans, etc. You must prune the trees at least once while the ground

crop is growing to reduce shading and add more nitrogen.  
Address: Asst. Prof., Dep. of Agronomy and Soils, 202  
Funchess Hall, Auburn Univ., Auburn, Alabama 36849-5412.  
Phone: 205-844-4100.

1421. **Product Name:** Whole Bean Natto.  
**Manufacturer's Name:** Leo Risin' Foods.  
**Manufacturer's Address:** 1525 Rhode Island, Lawrence,  
KS 66044. Phone: 913-832-1521.  
**Date of Introduction:** 1992. October.  
**Ingredients:** Whole organic soybeans, and *Bacillus subtilis*  
var. natto.  
**Wt/Vol., Packaging, Price:** 4 oz.  
**How Stored:** Frozen.  
**New Product–Documentation:** Talk with Clayton  
McHenry, founder and owner of Leo Risin' Foods. 1994.  
Feb. 21. He started making natto at the above address in Oct.  
1992. He also makes mochi.

Letter and Label sent by Clayton McHenry. 1994. Feb.  
22. Label. 3.5 by 2.5 inches. "Natto is a strong flavored,  
fermented soyfood. Use as a topping for rice or noodles,  
saute with vegetables, or use in soups." An illustration shows  
Farmer John and lots of animated little soybeans running and  
dancing around the edge of the label.

1422. Louie, Elaine. 1992. 43 peaceful acres of Japan in  
Connecticut: A retreat that evokes home. *New York Times*.  
Nov. 12. p. C8.

• **Summary:** On weekends, Isao Aiba, his wife Lisa Sorce,  
and their two kids live Japanese style on 43 acres in Lime  
Rock, Connecticut, in the foothills of the Berkshires. And  
the family shares their retreat with 3-10 Japanese guests each  
weekend.

"Every two months, Ms. Sorce drives to Yaohan, a  
Japanese supermarket in Fort Lee, New Jersey, to stock  
up on raw fish, pickles, tiny dried fish and natto, a natto, a  
fermented [soy] bean favored in the north and east of Japan."

At home in Connecticut, her breakfasts typically include  
miso soup.

1423. Griffis, Gil; Wiedermann, Lars. 1992. Marketing food-  
quality soybeans in Japan: A manual on how to profit from  
the niche market in Japan for value-added soybeans. 5th ed.  
St. Louis, Missouri: United Soybean Board. 25 p. Nov. 28  
cm.

• **Summary:** Contents: Introduction. Japan: Desired soybean  
characteristics, tofu (procedure for making tofu, desired  
soybean characteristics, color of hilum, seed size {the larger  
the better, preferably more than 20 grams/100 beans}, color  
of cotyledons, hull, composition, special notes, American  
interpretation), miso (same categories of information as  
tofu), natto (ditto; seed size: The smaller the better, with a  
maximum of 5.5 mm diameter. Round shape is preferred  
to oval in order to limit swelling during the soaking and

boiling processes), food quality soybean varieties (name or  
code-name of 42 varieties, maturity zone, release year, used  
to make what soyfoods), distribution channels, marketing  
channels, protocol, pricing, organically-grown soybeans.

Taiwan: Introduction, list of 4 major buyers, users, and  
trade associations. Korea. Southeast Asia. United States.

Appendix I. Distribution systems for soybeans used for  
food in Japan: Tofu (23,000 tofu shops of which 13,000 are  
members of the Tofu Association), natto, miso.

Appendix II. Food soybean imports by country of origin,  
1984-1991. USA is the largest supplier (845,000 tonnes in  
1991), followed by China (279,000), then Canada (28,000).  
Total imports, which have stayed about constant during this  
period, were 1,152,000 tonnes in 1991.

Appendix III. Distribution by usage of soybeans used  
for food–1991, direct use only in tonnes (metric tons). Tofu:  
607,000 tonnes total, of which 562,000 come from the USA  
and Canada, 25,000 from China, and 40,000 from Japan. Up  
2% from 1989.

Miso: 171,000 tonnes total, of which 38,000 come from  
the USA and Canada, 121,000 from China, and 12,000 from  
Japan. Up 0.5% from 1989.

Natto: 147,000 tonnes total, of which 87,000 come from  
the USA and Canada, 50,000 from China, and 10,000 from  
Japan. Up 9% from 1989.

Other: 39,000 tonnes total, of which 20,000 come from  
the USA and Canada, none from China, and 19,000 from  
Japan. Total food use of 964,000 tons is up 2% from 1989.  
Source: Japanese trade newspapers and trade associations.  
These figures do not include a estimated 492,000 tonnes of  
soybeans used indirectly (in the form of defatted soybean  
meal) for soy sauce, 222,000 tonnes used for soy protein, and  
20,000 tonnes for other indirect uses.

Appendix IV. Directory of direct importers of food-  
quality soybeans for each is given: Home office in Japan.  
Representative office in the U.S.

Appendix V. Traders of food-quality soybeans (3  
companies).

Appendix VI. Soy food organizations in Japan (tofu,  
miso, soymilk, packaged tofu, natto). Appendix VII. Helpful  
contacts.

Food quality soybean varieties (with maturity group  
/ zone, and year released; table, p. 5): Chico (00, 1983),  
Grande (0, 1976), Proto (0, 1989), Minnatto (0, 1989),  
NattoKing [Nattoking] (I, 1988), Disoy (I, 1967), Vinton  
(I, 1978), Vinton 81 (I, 1981), King Natto (I, 1985), Kato  
(I, 1989), Magna (II, 1967), Prize (II, 1967), Marion (II,  
1976), LS201 (II, 1989), Provar (II, 1969), Beeson (II, 1969),  
Kanrich (III, 1956), Kim (III, 1956), LS301 (III, 1989),  
Verde (III, 1967), IL2 (III, 1989; from Illinois), Hawk (III,  
?), Emerald (IV, 1975), Vance (V, 1986), Camp (V, 1989),  
Hartz 936X (VI, 1981), Hartz 914 (VI, 1989), Hartz 922 (VI  
1989), Merrimax (? , 1986).

Note: This report was originally published in Sept. 1989,



mainly for use by the American Soybean Association office in Tokyo. Address: 1. Division Director for Asia; 2. Country Director for Japan. Both: American Soybean Assoc.

1424. *Toyo Shinpo (Soyfoods News)*, 1992. Nattô no seizôhō. Kikkōman (KK) ga shutsugan. Tokkyo shutsugan shōroku [How to make natto: Kikkoman applied for a patent. Details of the patent application]. Dec. 1. p. 12. [Jap]  
 • **Summary:** A long and detailed article.

1425. McCloud, Tina. 1992. Natto: A breakfast dish that's an acquired taste. *Press (Newport News, Virginia)*. Dec. 7.  
 • **Summary:** "It's the color and consistency of pork and beans, but sticks together like stretched chewing gum." The owner of two Japanese restaurants in Newport News, Mr. K. Nishikawa, notes that "nibbling natto seems a pretty disagreeable way to start the day. Unembellished natto has 'no flavor and smells funny.'" He imports the fermented soybean product frozen from Japan. The key lies in the seasoning. In northern Japan, natto is widely eaten as a breakfast food, served over steamed rice and mixed with mustard and soy sauce. Some people mix in onions and raw egg. The sushi chef at one of Mr. Nishikawa's restaurants serves natto in sushi.

1426. *Toyo Shinpo (Soyfoods News)*, 1992. Nattô to tenpe wa kyōzon dekiru ka? [Can natto and tempeh coexist?]. Dec. 11. p. 7. [Jap]  
 • **Summary:** The bacterial culture used in the natto fermentation can cause spoilage problems if it gets into tempeh cultures—and it can get in quite easily unless strictly controlled.

1427. Arocena, Javier. 1992. [Re: Recent developments at Zuaitzo]. Letter to William Shurtleff at Soyfoods Center, Dec. 14. 2 p. Typed, with signature on letterhead. [Spa; eng+]  
 • **Summary:** In June 1988 he moved his company to Plaza Santa Maria, 01001 Vitoria-Gasteiz. He knows of three other soyfoods manufacturers in Spain: Natur-Soy, Vegetalia, and La Sojeria, all near Barcelona.

"I was a pioneer in the production of tofu and seitan in Spain but for the last 12 years I have kept on doing the same thing, working only at the family level, making little but doing it well.

"Now we are living in the country at Villanueva Tobera, 09214 Condado de Treviño (Burgos), Spain... about 25 km from Vitoria-Gasteiz.

"As of today, our plans are not to increase our work with tofu and tempeh derivatives, but rather to develop new products, above all the full gamut of fermented soy products... such as miso, tamari, natto, and amazake." But since he has difficulty understanding English, he would like to get Spanish-language publications. Address: Zuaitzo,

Villanueva Tobera, 09214 Condado de Treviño (Burgos), Spain. Phone: 945/28 86 30.

1428. Ontario Soybean Growers' Marketing Board. 1992. Annual report. Box 1199, Chatham, ONT N7M 5L8, Canada. 24 p. 28 cm.

• **Summary:** This is a report for the year 1992. Contents: Mission statement. Chairman's message (Larry Miehls). Secretary manager's message (Fred Brandenburg, Dec. 1992). OSGMB summary of major activities in 1992. Auditor's report and balance sheet. 1992 soybean & research funding (incl. breeding of soybeans for tofu and natto). Ontario soybeans—supply and demand, 1989-1992. Soybeans: Area, production and farm value, by county, 1991, with provincial totals [including county and district totals], 1986-1991. Ontario marketings, 1989-91. Ontario soybeans: Production, crushings, imports, exports. 1991 crop year marketing by county. Ontario soybean exports by destination in metric tons. Soybean meal: Canadian imports and exports. Soybean oil: Canadian imports and exports. Quality of the 1991 soybean crop by county (in terms of mean oil content and mean protein content). Cash prices for Ontario soybeans (1990-1992). Ontario basis values (cents over futures). Weekly adjusted producer basis. Soybean supply and demand, 1990-1992: USA, world. OSGMB appointments for 1992 (officers and committees). 1992 district committee members of soybean board. Address: Chatham, ONT, Canada. Phone: 519-352-7730.

1429. Okada, Noriyuki. 1992. [Searching for thua-nao (2). Isolation of vitamin B-12 producing bacteria]. *Daizu Geppo (Soybean Monthly News)* 179:21-26. [Jap]\*

1430. Buswell, Robert E., Jr. 1992. The Zen monastic experience: Buddhist practice in contemporary Korea. Princeton, New Jersey: Princeton University Press. xiii + 264 p. + [8] p. of plates. See p. 120-21. Illust. Index. 25 cm. [190+\* ref]

• **Summary:** The section titled "Meals" (p. 120-25) notes that there are many similarities between the diet in the monasteries and that in the homes of the local agricultural peasants. "The major difference is that all meals served in the monasteries are vegetarian [actually vegan]. The bodhisattva precepts of the Mahayana branch of Buddhism forbid monks from eating the flesh of any sentient being." Cereal grains provide 70-80% of the caloric intake. "In addition to steamed rice, meals always include some kind of soup (*kuk*)... The soup is generally based on toenjang, a fermented bean paste like Japanese miso and flavored with soy sauce (*kanjang*) and sesame salt."

"Bean products constitute one of the largest components of the monastic diet during all seasons. The basis of many bean products is *meju*, a fermented bean paste somewhat like the Japanese *nattô* [more like the Japanese *miso-dama*,

or soybean koji]. *Meju* is used as a major ingredient in producing soy sauce, red-pepper paste, and *toenjang*. Cooked black [soy] beans, seasoned with soy sauce, sugar, and white sesame, are served at least once a day. Tofu (*tubu*), or bean curd, frequently appears on this menu, but this is always purchased from a professional maker, who delivers it to the monastery on the back of his motorcycle. When the tofu is especially fresh, it is served steamed in whole blocks, to be dipped into a sauce made of soya, sesame oil, and red-pepper sauce.”

Because of Mahayana Buddhism’s dietary restrictions, monks don’t eat garlic or onions, so widespread in the diets of regular Koreans. Those foods are considered “to be mild aphrodisiacs, something celibates can do without. To compensate for the blandness of the food, the kitchen staff replaces the garlic and onions with lots of red pepper (*koch’u*), along with red-pepper paste (*koch’ujang*),” brown sesame and white sesame. At the ceremonial dinner on festive days, white rice is replaced by glutinous rice and special dishes such as fried tofu and nori (*kim*) are served.

Note: The author was privileged to spend five years as a Buddhist monk in Korean monasteries between 1974 and 1979, primarily at Songgwang-sa. He made two additional trips to Songgwang-sa in Nov. 1987 and July 1988. The monastery is in Suncheon near the southern coast of Korea.

1431. Kawakami, Kozo. 1992. *Tsurezure Nihon shokumotsushi*. 2 v [Leisurely history of Japanese foods. Vols. 1-2]. Tokyo: Tokyo Bijutsu. Illust. 21 cm. [35+ ref. Jap]

• **Summary:** Vol. 1 (vi + 151 p.) contains chapters on: Ryokutô [ryokuto] (bundô, yaenari; p. 74-76, mentions tofu. Note: Kinch 1879 says *Phaseolus radiatus subtriloba* = bundô). Ganmodoki and hiryoju [tofu burgers] (p. 85-89; 9+5 ref.). Yose-dofu (p. 89-99; 13 ref.). Itoko-ni (p. 108-10; 13 ref.; with soybeans, azuki beans and tofu). Gomashio (p. 128-30; 7 ref.).

Vol. 2 (3 + 151 + 5 p.): A color illustration titled (*Nori-zukuri no zu*), by Katsukawa Shunsen (?) on the dust jacket shows women making nori in old Japan. They are chopping freshly collected nori and drying it in sheets. Another old 3-part illustration of making nori is printed on the cover. Contents (centered on foods and treats from the sea) includes: Nori and kawa-nori (from the sea and from rivers. p. 1-5; 35 ref. 1 illust.). Asakusa nori, Kassai nori, Shinagawa nori, and other nori from the Pacific Coast and Inland Sea (*Setonai-kai*) during the Edo Period (p. 8-16, 39 ref. 4 illust.). Nori from the Japan Sea (*Nihonkai*) No. 1: Izumo nori, Uppuri nori, and Kamoji nori. Uppuri is a place near Izumo, and Kamoji is a wig-like hair filler (p. 17-20, 21 ref.). Nori from the Japan Sea (*Nihonkai*) No. 2: Kuro nori, Yuki nori, Noto nori, and Kasashima / Kasajima of Echigo nori (p. 21-24, 21 ref.). The story of river nori, Shiba river nori, Nikko nori, and Kikuchi nori (p. 25-30, 26 ref. 1 illust.). Dried frozen tokoroten (*kôri tokoroten*), made from frozen

seaweed (p. 98-102, 3 ref.) Mizukara (a spicy food made from kombu, p. 103-05, 16 ref.). Musubi kombu, musubi kanpyo, and musubi sayori (musubi means “tied up in like a bow in a special way;” p. 106-10, 25 ref. 2 illust.). Musubi yamaimo (mountain glutinous yam) and musubi tofu (both tied up in a special decorative way. p. 111-14, 14 ref.). Also contains other interesting illustrations and chapters. Address: Japan.

1432. Sass, Lorna J. 1992. *An ecological kitchen: Healthy meals for you and the planet*. New York, NY: William Morrow and Company, Inc. xv + 492 p. Index. 26 cm. [35+\* ref]

• **Summary:** This excellent vegetarian (actually vegan), ecological cookbook, proves that the most environmentally sound diet is also the healthiest and, for many, the most delicious and economical. It emphasizes whole grains, fruits and vegetables, focuses on unprocessed and minimally packaged foods, use of regional and seasonal foods, efficient menu planning, and creative recycling of leftovers. Delightful quotations relevant to the book’s subject are scattered throughout.

The author’s guiding principles for cooking ecologically are: “Eat a plant-based [vegan] diet; buy organic, regional, seasonal produce whenever possible; and use nontoxic products to keep your kitchen clean.”

The chapter titled “Tofu and tempeh” (p. 217-31) contains basic information and many recipes. Other soy-related recipes include: Thai vegetable soup (with tofu, p. 39). Ten-ingredient lo mien (with tofu, p. 165-66). Triple bean maybe it’s chili (p. 186-87). Black soybeans (p. 191-92; keep the skins on by adding salt). Curried mustard greens with tofu (p. 255). Chinese-style stir-fry of kale, onions, and marinated tofu (p. 258). Tahini-miso spread (p. 315). Sun-dried tomato dip (with tofu, p. 318). Brilliant beet dip (with tofu, p. 319). Onion upside-down cornbread (with tofu, p. 323-24). Tofu whip (like whipped cream or whip topping, p. 398).

The very fine chapter / glossary “Ingredients A to Z” (p. 399-468) includes: Aduki / azuki beans, agar, almond butter, almonds, amaranth, amasake (incl. koji), arame, barley malt syrup.

Black beans—fermented (salty black beans): “Black beans, fermented (Salty black beans): A little of this Chinese specialty—small black soybeans preserved in salt—goes a long way. About 1 tablespoon adds a deliciously complex flavor to stir-fries. Chop the beans finely to disperse their flavor. If you like the taste but want to reduce the salt, soak the beans briefly in water before using. Fermented black beans last for about a year in a well-sealed jar under refrigeration.

“Bragg Liquid Aminos: This is a *very tasty* soy-sauce-like condiment made by extracting amino acids from organic soybeans. Its flavor is more winelike and complex than most soy sauces. It is salty, so sprinkle sparingly. (There is no

added salt, but 125 milligrams of sodium per ½ teaspoon come from the natural sodium in the soybeans.)

“Unlike soy sauce, Bragg Liquid Aminos is not fermented, making it an ideal seasoning for those who suffer from yeast sensitivities. Delicious added to stir-fries or plain-cooked grains. It is readily available in health food stores.” Also in natural food stores.

Daikon, dulce, gomashio, hijicki / hizicki [sic, hijiki], job’s tears, kombu, kuzu (kudzu), kuzu kiri, lupins, miso, mochi, natto, nigari, nori, peanut butter, peanuts, quinoa, rice–brown, rice cakes, rice syrup, sea vegetables, tamari-roasted seeds, seitan (wheat gluten), sesame butter (tahini), sesame oil, sesame seeds, shoyu, soybeans, soybeans–black, soy cheese, soy flakes, soy flour, soyfoods, soy grits, soy ice cream, soy milk, soynuts, soy oil, soy powder (powdered soy milk), soysage, soy sauce, soy yogurt (fermented), tahini, tamari soy sauce, tempeh, tofu, umeboshi plums, wakame, wasabi, winged beans. Note: Also contains recipes for many of these glossary items.

A color portrait photo on the inside rear dust jacket shows Lorna Sass—with a brief biography; she is a culinary historian, cookbook author, and food writer. Address: Box 704, New York City, NY 10024.

1433. Tamang, Jyoti P. 1992. Studies on the microflora of some traditional fermented foods of Darjeeling hills and Sikkim. PhD thesis, University of North Bengal, Darjeeling, India. 224 p. \*

• **Summary:** Products closely resembling kinema include: *Hawaijar* (Manipur in North-East India [NEI]). *Bekang-um* (Mizoram in NEI). *Troombai* (Meghalaya in NEI). *Akhoni* (Nagaland in NEI). *Itohiki-natto* (Japan). *Tooa-nao* [*Thua-nao*] (Northern Thailand). *Chungkook-jang* (Korea).

Note 1. This is the earliest document seen (Jan. 2012) that uses the word “Akhoni” to refer to a fermented soyfood from Nagaland and a close relative of Nepalese kinema and Japanese natto.

Note 2. This is the earliest document seen (Oct. 2010) that mentions “Bekang-um” (also called “bekang”), a close relative of Nepalese kinema and Japanese natto.

Note 3. This is the earliest document seen (Oct. 2010) that mentions “Troombai,” a close relative of Nepalese kinema and Japanese natto.

Note 4. This is the earliest document seen (Jan. 2012) that contains the word “Tooa-nao,” an alternative spelling for *thua-nao*, a close relative of Nepalese kinema and Japanese natto, or the alternative spelling “Chungkook-jang” for Korean-style natto. Address: Univ. of North Bengal, NBU 734430, District of Darjeeling, West Bengal, India.

1434. *Agri-Book Magazine* (Exeter, ONT, Canada). 1993. Beans in Canada. 19(3):1-23. Jan.

• **Summary:** This entire special issue is about soybeans in Canada, with emphasis on soybean production. The

magazine is printed with soy ink. Articles include: Top yields with no-till. Ten myths about conservation tillage. Ontario Soybean Growers’ Marketing Board Newsletter—new format (insert). Ad for symposium “Soybeans in Canada: Beyond 100 Years,” organized by the Ontario Soybean Growers’ Marketing Board, to be held 28-30 March 1993 in Toronto, Ontario, Canada at the Regal Constellation Hotel; gives names and photos of speakers. Breeding the soybeans of the future. Genetic ingenuity.

In the Newsletter, an article titled “Profile of Larry Miehls, Soybean Board Chairman,” notes: “Sixty-five percent of Ontario’s soybeans are grown in five counties—Essex, Kent, Lambton, Middlesex, and Elgin... Today the majority of acres goes to two Ontario crushing plants. Twenty percent of the crop is exported and half of that is for human consumption.” Therefore breeders need to concentrate on developing soybeans with more sugar, more protein, and less oil. “There is also a trend toward whole roasted beans for animal feed, and I see this as a major area of growth... For food quality soybeans, Japan remains the board’s largest export customer.

“Pacific rim customers are interested in buying Ontario soybeans because of their high quality. Canada is also credited with strict grading standards, good processing people—the cleaners and the baggers—and farmers who keep up-to-date. Natto and tofu quality soybeans are popular among the Pacific rim customers. ‘The breeders have done a good job of developing beans to meet customer needs...

“The Harovinton, a tofu bean, was developed at the Harrow Research Station with a lot of board support. It’s really starting to take off,” says Larry.”

1435. University of Illinois, Dep. of Agronomy. 1993. USDA Soybean Germplasm Collection: Public varieties (United States and Canada). Urbana, Illinois. 3 p. Feb. 16. Unpublished typescript. 28 cm.

• **Summary:** Lists 338 public soybean varieties that are currently in the USDA Germplasm Collection. For each variety is given: Year the variety was licensed or released. Maturity group. Code letters for the following: Stem termination (indeterminate, semi-determinate, determinate), flower color, pubescence color, pubescence form, pubescence density, pod color, seed coat luster, seed coat color, hylum color, and other unique characteristics.

Across the top of page 1 is a horizontal table. In the top row are 13 maturity groups from 000 to X. In the second row are the number of varieties belonging to each maturity group, plus the total (338).

Note: This document was sent to Soyfoods Center by Dr. Richard Bernard in Dec. 1998. On it he wrote a “v” to the left of the following varieties, which he believes to be a large-seeded vegetable-type soybeans: Disoy (1967), Emerald (1975), Grande (1976), Kahala (1969), Kaikoo (1969), Kailua (1969), Kanrich (1956), Kim (1956), LS201

(1990), LS301 (1990), Magna (1967), Merrimax (1986), Mokapu Summer (1969), Prize (1967), Verde (1967), Vinton (1978), Vinton 81 (1981).

He also wrote a “n” to the left of the following varieties, which he believes to be a small-seeded soybeans released for natto or sprouts: Camp (1989), Canatto (1985), Chico (1983), IL1 (1989), IL2 (1989) (Note: IL varieties are from Illinois), Minnatto (1989), Nattawa (1981), Nattosan (1989), SS201 (1989), SS202 (1989), Vance (1986).

At the end he wrote in the names of large-seeded vegetable-type soybeans released from 1992 to 1997: IA2012, IA2016, IA2020, IA2034, IA3001, IA3002, IA3006 (Note: IA varieties are from the Iowa and Puerto Rico AES), Ohio FG1, Ohio FG2, Saturn. He also wrote in the names of small-seeded natto- or sprout-type soybeans released from 1992 to 1997: AC Pinson, Danatto, IA2005, IA2023, IA2024, IA2035, IA3007, IA3008, IA4001, Mercury, Micron, Pearl, TNS. Address: Univ. of Illinois, Urbana, Illinois.

1436. Tanner, Jack W. 1993. The first one hundred years (Continued—Document part II). Paper presented at Soybeans in Canada: Beyond 100 Years, a symposium organized by the Ontario Soybean Growers’ Marketing Board. 6 p. Held 28-30 March 1993 in Toronto, Ontario, Canada at the Regal Constellation Hotel.

• **Summary:** Continued from page 3. “Honours of C.A. Zavitz: First Degree Class of OAC, 1888. First Head of Department of Field Husbandry, 1904. Published in Volume 1 of *Agronomy Journal*, 1907, 1908, 1909. First Canadian Fellow of American Society of Agronomy, 1915. Doctor of Science (Hon.), University of Toronto, 1916. Doctor of Laws, University of Western Ontario, 1935. Inductee, Canadian Agricultural Hall of Fame, 1977.”

After Zavitz’s introduction in 1893, William Saunders began soybean research at the Central Experimental Farm (CEF) in Ottawa, Ontario. In 1923 Fred Dimmock started the Harrow soybean program; when he moved to Ottawa, Cass Owen took over the soybean research at Harrow. By the end of the 1930s, six soybean varieties had been registered in Canada: OAC 211 (1923), AK (Harrow) (1933, Harrow), Mandarin (Ottawa) (1934, CEF), Kabott (1937, CEF), Goldsoy (1938, OAC), and Pagoda (1939, CEF).

In 1932 some 7,781 acres of soybeans were reported in Canada, increasing to 10,000–11,000 acres by 1940.

“The first record of commercial soybean production occurred in Essex and Kent counties in 1925. The first Ontario Department of Agriculture extension bulletin to mention soybeans in 1932 listed its uses for hay, soiling crop, pasture, ensilage, seed for oil and meal, and straw. The crop was perceived by farmers as an excellent annual forage. Beans for were shipped to the Dominion Linseed Oil mill in Baden and to the first soybean crushing plant in Chatham which opened in 1934... Victory Soya Mills, constructed in

1944 in Toronto, played a key role in the development of soybeans in Ontario. The company aggressively promoted the crop in late 1940s and 1950s. The company produced bulletins, conducted yield competitions, and produced newspaper articles, movies and newsletters. It also provided extension persons, Ivan Roberts and Ralph Chamberlain to promote the crop. However, the crop was slow to expand out of the traditional 5-country area of the southwest part of the province.

“One of the most momentous occurrences in soybean development dates back to 1936 when Cass Owen at the Harrow Research Station made the original cross that ultimately resulted in the variety Harosoy. Released in 1951, Harosoy dominated the Canadian acreage for more than 35 years. It became the major variety in the U.S. and constituted 26% of the total U.S. acreage in 1966, including 42% of the crop in Illinois, 48% in Indiana, 46% in Ohio and 58% of Michigan’s crop. Subsequent varieties developed by Buzzell at Harrow have continued to provide outstanding varieties to the farmers of that area.

“Another milestone in the evolution of the soybean crop in Ontario came in January 1949 with the establishment of the Ontario Soya-Bean Growers’ Marketing Board. Established initially to improve marketing procedures to reduce price instability, the Board’s role now includes negotiations with the trade, provision of market information relating to the oilseed industry to its members, government lobbying, market development both domestically and internationally, creation of promotional material, administration of government programs and support of research. With regard to the latter, the Board has provided approximately \$1.3 million in research support in the past 10 years. The initial membership of the Board has grown from 1722 in 1949 to 17,272 in 1991.”

Throughout the 1950s and 1960s, “much effort was put forward towards expanding the soybean acreage into the shorter season parts of the Province. While recognizing that weed control, lack of decent nodulation and appropriate equipment were deterrents, the major limitation was the lack of decent varieties. Bluntly put, they were dogs. The release of Maple Arrow by Harvey Voldeng from the Ottawa program represented the break that was needed to move the crop. The cross, between Harosoy and an early Swedish line, 840-7-3, was made by Buzzell for Lorne Donovan, the breeder at Ottawa who had preceded Voldeng. Dave Hume at Guelph with major support from the OMAF Plant Industry Branch mounted major research and extension programs for expansion of the crop. The crop has since created its own momentum, fueled by a whole series of outstanding early varieties developed by Voldeng at Ottawa and Beversdorf at Guelph.

“A few other names require mention. George Jones, an early promoter of the crop, weed control wizard and successful breeder, Baldur Stefansson in Manitoba who

laboured for 20 years attempting to establish the crop in the west, abandoned the idea and subsequently became one of the fathers of the canola industry; and Brian Buttery at Harrow who has worked to improve our understanding of yield in soybeans.

“Special mention should be made too of the contribution of the Colleges of Agricultural Technology, especially Ridgetown. RCAT has, since its inception, provided excellent production and varietal information to the farmers of the area.

“The first private line, XK 505, was supported for registration in 1973. There are currently 4 public and 4 private full-time breeding programs in Ontario. In addition, several American-based companies evaluate and submit lines for registration. The list of excellent varieties available augers well for the future.

“My role at this conference was to look back. It has been an eventful and exciting 100 years for the soybean crop and those dedicated to its expansion. But times are changing and, I expect, ‘we ain’t seen nothing yet’. The 20% oil 40% protein bean has served us well but there are already changes afoot in the marketplace. The soybean which was one of the first truly industrial crops must be modified to compete in the future. The development of natto beans at Ottawa and the shift of Harrow to concentrate on edible beans for export are but the beginning. Compositional changes in fatty acid distribution and protein are already underway. Changes in morphology and growth habit of the plant appear to offer new promise for higher yielding, more broadly adapted varieties. The new technologies of molecular genetics, while slow to reach soybeans, are on the verge of enabling the development of beans whose attributes may be limited only by the imagination of those of us who are over 30 years old. The future starts tomorrow. Somehow, I feel that Zavitz is looking down at all this, and, I suspect, he is smiling.”  
Address: Crop Science Dep., Univ. of Guelph, Guelph, Ontario, Canada.

1437. Nagayama, Hisao; Tokue, Akihiko. 1993. The naked kitchen: Nattô. *Look Japan (Tokyo)* 39(445):24-25. April.  
• **Summary:** “Natto is formidable fare—fermented soy beans with a sticky, slippery consistency and a pungent odor that lingers long after the last swallow. But once you get used to these deliciously gooey beans, you will likely find yourself hooked... Natto first appeared [in Japan] 1,000 years ago, but it did not catch on until about 700 years later, when it became a favorite among the residents of the capital city at the time, Edo (old Tokyo).” Upper class Kyoto residents used to call natto “*ito*” (thread), “a delicate reference to the minute, sticky threads that cling to the lips of even the most careful natto-eater.”

Color photos show: (1) Natto being lifted with chopsticks from a bowl, with its many threads stretching downward. (2) Natto atop a bowl of white rice. (3) Various

traditional and modern natto packages, including natto wrapped in rice straw. (4-6) Three steps in eating a package of natto: Simply empty the natto packet into a bowl, add chopped green onions and soy sauce, and stir until sticky strings form.

1438. Library of Congress, Subject Cataloging Div., Processing Services. 1993. Library of Congress subject headings. 16th edition. Washington, DC: Cataloging Distribution Service, Library of Congress. 4 volumes.

• **Summary:** For the basic idea, words and LC call numbers see the 12th edition (1989). Address: Washington, DC.

1439. *Toyo Shinpo (Soyfoods News)*. 1993. Kaigai foto: Chûgoku, Unnanshō ni atta kotsubu nattō [Overseas photo: Natto made from small-seeded soybeans found in Yunnan province, China]. July 11. p. 2. [Jap]

• **Summary:** A photo taken in China, at about the time this article was written, shows the soybeans on a circular tray. The article states: In Yunnan province of China, their culture and foods are very much like Japanese—or so we hear. The gate of Tokukōshū, ...shi, at their open market, their vendors selling nattō among rakkyō pickles and mountain vegetable (*yamana sansai*) pickles. Their natto soybeans are smaller than those of Japan and their natto does not have as much stickiness / stringiness as Japanese natto. But their natto does have that special natto taste spreading in your mouth. They said “Everyone loves natto.” I am not surprised since they are part of the same Ye Shulin culture (*Shōyōjurin bunka*) their food culture might also be similar. The price of their natto was 1 gen (about 23 yen) for 1 cup.

Note 1. Yunnan is a large province located in the far southwest of China; the capital is Kunming. The province borders on Burma, Laos, and Vietnam. Ethnic minorities in Yunnan account for about 34% of its total population. Major ethnic groups include the Yi, Bai, Hani, Zhuang, Dai and Miao.

Note 2. Since the 1970s, Japanese anthropologists have proposed the theory that Yunnan province, in southern China, is the source of Japan’s culture. One early wave of people migrated from there to Japan. In addition to rice cultivation, there are many cultural similarities.

1440. Katoh, Kiyooki. 1993. Current status of tempeh in Japan (Interview). *SoyaScan Notes*. July 20. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The Third Asian Symposium on Non-Salted Soybean Fermentation and the International Soybean Food Fair will be held in Akita, Japan, on 4-6 June 1994. There is a legend in Japan that natto originated in Akita, and there is also a large natto manufacturer there. Many countries in Southeast Asia will participate. He is still very involved in tempeh issues in Japan, and maintains a close contact with Indonesian tempeh researchers. The Tempeh Study

Group (*Kenkyu-kai*) has its regular meeting twice a year and 60-70 people (including himself) typically attend. A very good and popular restaurant in Shibuya, Tokyo, named Jembatan Mérah (Red Bridge), features many delicious tempeh dishes. They feature ethnic foods, including Thai and Vietnamese cuisines. The chef of the restaurant used to work with Torigoe Seifun. Their tempeh is made by the village cooperative shop in Hyogo prefecture (initiated as part of a local community activation program). This tempeh shop ships their tempeh all over Japan, including to the Indonesian embassy in Tokyo, several Indonesian restaurants in Tokyo, and to individuals who order it. The only other tempeh shop, also part of a village activation program, is led by Prof. Kazuko Noguchi (a woman) of Saga. When Mr. Kanasugi died, the natto people discontinued their interest in tempeh. All the large private companies (Marusan, Torigoe Seifun) also stopped. Address: Tajimaya rice company, International Affairs, Japan.

1441. *Toyo Shinpo (Soyfoods News)*, 1993. Nattô chûshin ni shinpojiumu: 94 nen 6 gatsu Akita de kokusai Nattô kaigi hiraku [Symposium centered on natto: International Natto Symposium will be held in June 1994 in Akita]. July 21. p. 27. [Jap]

1442. Executive Committee Secretariat. 1993. The Roots of Biotechnology in Monsoon Asia: The Third Asian Symposium on Non-Salted Soybean Fermentation and International Soybean Food Fair. Akita Cultural Center, Akita City, Japan: 4-6 June 1994 (Leaflet). Akita, Japan. 2 p. July.

• **Summary:** The executive committee for this event is: Chair: Prof. Tadao Watanabe. Vice-Chair: Prof. Fumio Yamauchi. Indonesia Advisor: Dr. Darwin Karyadi. United Nations University (UNU) Food and Nutrition Programme Advisor: Dr. Abraham Besrat.

The symposium hopes to focus on South-South cooperation for technical transfer of soybean technologies (koji, tempe, natto) to Africa in order to alleviate an impending protein crisis beyond the year 2000.

Program outline: Part I: International Soybean Food Fair—Industrial/commercial exhibition and cooking demonstration of ethnic cuisine using soybean products. Part II: Public Symposium—World soybean overview with perspectives for international technical cooperation in Africa. Part III: The Third Asian Symposium on Non-Salted Soybean Fermentation. Session 1. Koji for fermented soybean (Kikkoman, Nagano Miso Institute, China, Korea, Akita). Session 2. Natto in Asia—Microbiology, enzymology, health-medical studies. Kinema of Nepal, Tuanao [Thua-nao] of northern Nepal, Bhutan. Session 3. Tempe (Overview by Dr. Darwin Karyadi, contributions from Indonesia, Germany, USA, Japan and others—on microbiology, biochemistry, nutrition, physiology, medical

studies, cooking, and industrial development). Part IV: The Role of Soybeans in Africa—The Perspective beyond 2000 (organized in cooperation with UNU Food and Nutrition Program). Sessions: Agriculture of Sub-Saharan Africa and soybean development (World Bank, IITA, JICA). Tofu technology adapted to West Africa (Dr. Nakayama, IITA). Indigenous fermented legumes in West Africa. Introduction of soy into Sub-Saharan African diet. Achievements of UNU Tempe Training Program (Indonesia/UNU; with Poster presentation of UNU funded research). Proposal on South-South cooperation.

Technical tours will be organized from three participating countries: Indonesia, USA, Germany. Address: c/o Akita International Assoc., Aidx Building 8th floor, 2-1-60 Sanno, Akita City, Japan 010. Phone: 0188-64-1181.

1443. Hachmeister, Kathleen A.; Fung, Daniel Yee-Chak. 1993. Tempeh: A mold-modified indigenous fermented food made from soybeans and/or cereal grains. *Critical Reviews in Microbiology* 19(3):137-88. [185 ref]

• **Summary:** An excellent review of the literature. Contents: Introduction. Mold-modified indigenous fermented foods: Miso, shoyu (soy sauce), hamanatto, sufu, fermented rice (sierra rice), tapé (lao-chao), ang-kak, ogi, tempeh, ontjom (oncom, lontjom), bongkrek (tempeh bongkrek), kenima. Processing developments in legume tempeh manufacture: Traditional tempeh fermentation, industrial production of tempeh, methods of preparation (cleaning, dehulling, hydration and acid fermentation, partial cooking, draining, cooling, and surface drying, inoculation, fermentation containers, incubation, harvesting, storage, and preservation, uses and preparation of tempeh). Organoleptic properties of tempeh. Microbiological aspects of legume tempeh: Microbial ecology, traditional and modern soaking methods, effect of soaking, acidification, and initial bean pH, effect of boiling prior to inoculation, effect of *Klebsiella* and *Enterobacter*, effect of lactic acid bacteria and yeasts, microbiological safety and quality, heating prior to consumption. Nutritional quality of legume tempeh. Chemical and biochemical changes in legume tempeh: Changes in protein and amino acids, changes in carbohydrates, changes in lipids, antioxidant potential, changes in minerals, changes in vitamins. Antinutritional factors associated with legumes: Flatulence-producing factors, protease inhibitors, tannins, phytic acid, hemagglutinins, other antinutritional factors. Cereal grain tempeh—practical applications: Background information, materials and methods, results and discussion, conclusions and future developments. Summary. References. Address: Dep. of Animal Sciences and Industry, Kansas State Univ., Manhattan, KS 66506.

1444. *Toyo Shinpo (Soyfoods News)*, 1993. Atopii ni kiku: Amaransezu nattô [Effective against atopy: Amaranth natto

(new product)]. Oct. 1. p. 13. [Jap]

• **Summary:** A photo shows the front panel and one side of this new commercial natto product made with soybeans and amaranth.

Note: Atopy includes atopic dermatitis, eczema, etc.

1445. DeClercq, D.R.; Daun, J.K.; Tipples, K.H. 1993. Quality of Canadian soybean—1993. *Canadian Grain Commission, Crop Bulletin* No. 210. 9 p. Undated. [1 ref. Eng]

• **Summary:** Contents: Introduction. Weather and production review. Quality data. Methods: Samples, oil content, protein content, fatty acid composition, iodine value. Acknowledgements.

Figures show: (1) Map of Southern Ontario showing counties from which 1993 soybean survey samples were received. (2) Annual mean oil and protein content of Canadian soybean—1983-1993, Grades No. 1 and No. 2 Canada combined (oil averages 20.5%; meal 41.9%).

Tables show: (1) Production statistics for soybeans in Canada, 1983-1993 (seeded area {ha}, production {tonnes}, yield {tonnes/ha}). (2) Quality data for soybean harvest surveys No. 1 and No. 2 Canada grades: 1983-1993 (oil content, protein content {%). (3) Quality data for 1993 Ontario soybean crop by grade (Nos. 1-3). (4) Oil and protein content of 1993 Ontario soybeans by county and grade. (4) Oil and protein content of 1993 Ontario soybeans by county; No. 1 and No. 2 Canada grades combined. (5) Oil and protein content of 1993 Ontario soybeans by variety; No. 1 and No. 2 Canada grades combined. (6) Fatty acid composition for 1993 Ontario soybeans by variety; No. 1 and No. 2 Canada grades combined. (7) Soybean varieties registered in Canada: Oilseed type. Natto type (3 NattoKing and 1 Nattosan varieties). Tofu type (Harovinton, KG 91, and TK 89). Address: 1. Chemist; 2. Research scientist; 3. Director. All: Grain Research Lab., Canadian Grain Commission, 1404-303 Main Street, Winnipeg, Manitoba R3C 3G8, Canada.

1446. Hesseltine, Clifford W.; Kato, Eihachiro. 1993. Natto, a little-known fermented soybean food. Peoria, Illinois. 116 p. Nov. Unpublished typescript. 28 cm. [422 ref]

• **Summary:** This is the most complete document seen on natto in English. Written by two eminent microbiologists, it contains a superb bibliography. Contents: Introduction. Microorganisms. Production and process. Industrial production. Enzymes: Proteases, other enzymes, fibrinolytic activity. Vitamins. Nutritive value and use. Antibacterial activity. Mucilage. Lipids. Compounds produced by *B. natto*. Plasmids. Phages. Nitrogen fixation. Soybean varieties used. Natto-like foods. Future possible uses of *B. natto*. Books containing information on natto. References.

Talk with Dr. Hesseltine. 1994. Aug. 4. This review of the literature is similar to the one he did on miso with

Dr. Shibasaki. He has not worked on this book for quite a while, in part because Dr. Kato (whose family is in the natto business) does not answer his letters. He and Dr. Kato compiled the bibliography together, mostly from Chem. Abstracts (English) and Nakazawa 1950 (Japanese). Dr. Kato translated about 20 pages of the Japanese documents. Dr. Kato did some work on natto in Peoria with Drs. Hesseltine and Wang; they told him that if he would make a table of their results, they would write the rest of the article; he never replied. Dr. Hesseltine has copies of many of the Chem. Abstracts summaries but not many of the original documents cited. Address: 1. 5407 N. Isabell Ave., Peoria, Illinois 61614; 2. Meiji Univ., Tokyo, Japan.

1447. Fujita, Mitsugu; Nomura, K.; Hong, Kyongsu; Ito, Yae; et al. 1993. Purification and characterization of a strong fibrinolytic enzyme (nattokinase) in the vegetable cheese natto, a popular soybean fermented food in Japan. *Biochemical and Biophysical Research Communications* 197(3):1340-47. Dec. 30. [11 ref]

• **Summary:** Nattokinase is a strong fibrinolytic enzyme which was purified from natto. It was extracted from natto with a saline solution. Address: Biotechnology Research Laboratories, JCR Pharmaceuticals Co., Ltd., 3-2-61 Takatsukadai, Nishi-ku, Kobe 651-22, Japan.

1448. Ontario Soybean Growers' Marketing Board. 1993. Annual report. Box 1199, Chatham, ONT N7M 5L8, Canada. 27 p. Dec. 28 cm.

• **Summary:** This is a report for the year 1993. Contents: Mission statement. Chairman's message (Ron MacDougall). Secretary manager's message (Fred Brandenburg, Dec. 1993). OSGMB summary of major activities in 1992. Auditor's report and balance sheet. 1993 soybean & research funding (incl. breeding of soybeans for tofu and natto). Ontario soybeans—supply and demand, 1990-1993. Soybeans: Area, production and farm value, by county, 1992, with provincial totals [including county and district totals], 1986-1992. Ontario marketings, 1990-92. Ontario soybeans: Production, crushings, imports, exports. 1992 crop year marketings by county. Ontario soybean production history, 1942-1993. Ontario soybean exports by destination in metric tons. Soybean meal: Canadian imports and exports. Soybean oil: Canadian imports and exports. Quality of the 1992 soybean crop by county (in terms of mean oil content and mean protein content). Cash prices for Ontario soybeans (1990-1994). Ontario basis values (cents over futures). Weekly adjusted producer basis. Soybean supply and demand, 1990-1994: USA, world. OSGMB appointments for 1993 (officers and committees). 1993 district committee members of soybean board. Address: Chatham, ONT, Canada. Phone: 519-352-7730.

1449. Okada, Noriyuki. 1993. [Searching for thua-nao (3).

Production of thua-nao at a thua-nao mill]. *Daizu Geppo (Soybean Monthly News)* 187:16-21. [Jap]\*

1450. Okada, Noriyuki. 1993. [Searching for thua-nao (3). Thua-nao cooks in Thailand]. *Daizu Geppo (Soybean Monthly News)* 188:15-20. [Jap]\*

1451. Smith, Joyotee; Woodworth, J.B.; Dashiell, K.E. 1993. Government policy and farm level technologies: The expansion of soyabean in Nigeria. *Agricultural Systems in Africa* 3(1):20-32. IITA Journal Paper No: IITA/92/JA/06. 24 p. [25 ref]

• **Summary:** Contents: Introduction. Government policy, soybean production and adoption of improved varieties: Three periods of government policy (1960 to mid-1970s, mid-1970s to mid-1980s, and mid-1980s to the present). The study area and data collection. Empirical evidence: Production trend of soybean, home utilization and industrial use of soybean, competitiveness of domestically produced soybean vs. imports, soybean's increasing competitiveness as a cash crop, soybean's contribution to nutrition and its incorporation into rural diets, returns to farmers' resources, soybean's compatibility with the cropping system. Conclusions.

"In the continuing debate about the food crisis in Sub-Saharan Africa two major contributory factors are widely recognized: the lack of technologies appropriate for small-scale producers and the existence of pricing policies which discriminate against agriculture. This paper links the two factors and presents empirical evidence, from the case of soybean in Nigeria, which shows that overvalued exchange rates not only led to a decline in soybean production but also impeded the adoption of an appropriate technology (improved soybean varieties)."

Nigeria attained independence from Great Britain in 1960. The history of soybeans in Nigeria after that time can be conveniently divided into three periods. The first period dates from 1960 to the mid-1970s. There was a traditional market for palm and groundnut oil which was met by village-level processing of domestic crops. In addition, Nigeria exported large amounts of these oils. Soybeans were exported in unprocessed form. "There was no domestic demand for soybean oil, and no village-level processing of soybean was carried out." Disruptions from the Biafran civil war in the late 1960s led to a sharp decline in exports of soybeans and palm oil.

The second period, from the mid-1970s to the mid-1980s, started with a boom in the price of petroleum, Nigeria's most important mineral resource. This was followed by an over-valuation of the Nigerian currency (Naira), which reduced the competitiveness of locally produced products. Exports of edible oil and soybeans ceased. Increased demand was met increasingly from large imports, which included soymeal, groundnut cake, soybeans,

groundnuts, and palm oil. Some 50,000 tonnes of soy oil were also imported and increasingly accepted. Cheap imports reduced the incentives for domestic production. There was a small local market for soybeans in Kafanchan (Kaduna State), which was the center for the production of a local seasoning named daddawa or dawadawa, the main ingredient of which was locust beans. In the late 1970s daddawa producers started substituting soybeans for locust beans. This helped maintain a small demand for soybeans. "In the early 1980s improved soybean varieties became available, but were not adopted, presumably because with the disappearance of the export market the demand for soybean had become highly inelastic."

The third period, from the mid-1980s onwards, saw the occurrence of a number of changes which pushed up the price of soybeans. In 1986 the Nigerian government initiated a structural adjustment program (SAP) to stimulate economic recovery. The Naira was devalued from 1 Naira per U.S. dollar to 4 in 1986, then it further dropped to 9.25 Naira per dollar by 1991. Commodity marketing boards were abolished and agricultural prices deregulated. The import of major agricultural commodities such as corn, soybean meal, and edible vegetable oils were banned from 1985 to the present. The import of soybeans and other oilseeds was not banned. These changes stimulated production of soybeans, oil, and meal. "Demand for soybean increased more than other crops because around the mid 1980s government and non-government organizations (NGOs) such as hospitals, religious missions and health clinics started promoting soybean consumption and its nutritional value. This stimulated the incorporation of soybean into the local diet and into processed food products." The severe drought of 1983/84 also increased the substitution of soybean for locust bean in daddawa production. As demand for soybeans grew, improved varieties were adopted, which reduced costs, further stimulated production, and allowed Nigerian-grown soybeans to compete in price with imports. Thus the increased soybean demand was met from increased domestic production. Soybean imports began again in 1983 but remained relatively small. Thus soybean production fell during the second period but rose during the third, especially after 1986.

According to the Groundnut Marketing Board, during the 1966-68 period, soybean production in Nigeria was over 15,000 tons/year. It decreased slowly until in the early 1970s less than 9,000 tons/year were produced, falling to less than 2,000 tons/year in the 1972-76 period. Exports ceased after 1976. These trends appear consistent with USDA export data.

Between 1987 and 1990 the number of markets in Ibadan (in southwest Nigeria) increased from 2 to 19 and the number soybean retailers in these markets increased from 4 to 419! Only one Nigerian company produced soybean oil/feedcake prior to devaluation of the currency (production



was estimated at 500 tons), but in 1989 there were 6 such producers and production was estimated at over 117,000 tons. “In addition, food processing companies had started incorporating soybean in processed local foods, beverages, breakfast and baby foods, presumably with the dual objective of cutting costs and taking advantage of public awareness of soybean’s nutritional qualities. Most of these processing industries were started up after the devaluation of the currency in 1986.

In Benue State, soybean was grown mainly as a cash crop, and mainly by the Tiv ethnic group (in the eastern half of the State), but it was also used by Tiv farmers in 96% of the villages for home consumption—often in the preparation of daddawa or as a partial substitute for cowpea in the preparation of local foods previously made entirely from fried or steamed cowpea paste (*moinmoin* and *akara*). Soybeans contain twice as much protein as cowpeas, cost less than half as much, and are highly acceptable to consumers. Soybeans are also less expensive than locust beans, and their cooking time in daddawa production is about one-fourth that of locust beans.

Table 5 shows the results of a field survey on the reasons for producing soybeans in Benue State. In the Tiv area, 78% of the villages and 98% of the farmers were surveyed. Percentage of those surveyed who gave various reasons: Personal consumption / nutritional qualities 96%. Compatible for intercropping with a variety of crops 85%. Financial return 78%. Improves soil fertility and/or does well without fertilizers 52%. Requires less labor 13%. Address: International Inst. of Tropical Agriculture, P.M.B. 5320, Ibadan, Nigeria.

1452. Karki, Tika Bahadur. 1993. Country Report 9–Nepal. In: N. Chomchalow & P. Narong, eds. 1993. Soybean in Asia: Proceedings of the Planning Workshop for the Establishment of the Asian Component of a Global Network on Tropical and Subtropical Soybeans. Bangkok, Thailand: FAO Regional Office for Asia and the Pacific. viii + 218 p. See p. 79-86. RAPA Publication (FAO), No. 1993/6. • **Summary:** (1) Introduction. (2) Production. (3) Observation trials. (4) Grain legume crops improvement: Collection and maintenance of germplasm, breeding and varietal improvement, varieties for different ecological regions. (5) Agronomic investigation. (6) Pathological investigation. (7) Entomological investigation. (8) Processing: Tofu, kinema, soy drink (and soy yogurt / dahi). (9) Marketing. (10) Recommendations.

Tables: (1) Germplasm collection of pulses in Nepal. (2) Area, production and productivity of soybean in Nepal. (3) Chemical composition of *kinema* (on dry-weight basis).

Figures: (1) Traditional process of *kinema*. (2) Preparation of *kinema* starter. (3) Preparation of *kinema* using selected strains. (4) Marketing channel of soybean.

Table 2 shows: Area planted to soybeans grew from

18,400 ha in 1983 to 20,700 ha in 1989. Soybean production grew from 10,100 tonnes (metric tons) in 1983 to 12,800 tonnes in 1989. Soybean yield grew from 548 kg/ha in 1983 to 611 kg/ha in 1989.

“Traditionally, soybean is consumed in various forms. Green pods are popularly eaten as a snack food. The green beans are consumed as a delicious vegetable curry along with other leafy vegetables or with potato slices. The dried soybean is roasted, dehusked and split to prepare a popular snack item. The dried beans are soaked overnight and deep-fried in vegetable oil, salted and spiced and consumed as another popular snack item. These recipes are developed over a long period of time and constitute the integral component of Nepalese food preparations.” Address: Chief, Food Research Office, CFRL, Kathmandu, Nepal.

1453. Kitamura, Keisuke. 1993. Country Report 6–Japan. In: N. Chomchalow & P. Narong, eds. 1993. Soybean in Asia: Proceedings of the Planning Workshop for the Establishment of the Asian Component of a Global Network on Tropical and Subtropical Soybeans. Bangkok, Thailand: FAO Regional Office for Asia and the Pacific. viii + 218 p. See p. 64-69. RAPA Publication (FAO), No. 1993/6.

• **Summary:** Contents: (1) Production and uses. (2) Research activities. (3) Germplasm.

Germplasm: “Soybeans were introduced from abroad since the old days. Genetic resources of landraces were continuously collected and surveyed since the beginning of this century. In recent years, a number of soybean varieties were introduced from many foreign countries and international institutions, including Korea, China, Nepal, Thailand, USA, AVRDC, etc. Today the total soybean accessions are about 6,000 including wild soybeans. They are conserved and managed in the National Center of Genetic Resources within the National Institute of Agrobiological Resources.”

Figures: (1) Scheme of domestic soybean price in Japan. (2) Geographical distribution of soybean varieties according to their ecotypes and location of soybean breeding stations in Japan.

Tables: (1) Planted area, production and yield of soybean in Japan. Total planted area has decreased from 306,000 ha in 1960 to 146,000 ha in 1990. Production has decreased from 418,000 tonnes (metric tons) in 1960 to 220,000 tonnes in 1990. Yield has increased from 1,360 kg/ha in 1960 to a peak of 1,790 kg/ha in 1990. (2) Trends of soybean supply and demand. Japan’s imports have increased from 3,244,000 tonnes in 1970 to 4,330,000 tonnes in 1991, when 97.3% of the soybeans used in Japan were imported. Uses of soybeans in 1990: Oil 3,630,000 tonnes—up from 2,505,000 tonnes in 1970. Food 725,00 tonnes—up from 522,000 tonnes in 1970. Fermented products (miso, shoyu, natto) 196,000 tonnes—down from a peak of 208,000 tonnes in 1980. Animal feed 95,000 tonnes—up from 10,000 tonnes

in 1970. (3) Trends of soybean price. (4) Trends of seed production. (5) Soybean research activities in Japan. (6) Objectives of the respective breeding stations for soybean. (7) Characteristics of the leading and some unique soybean varieties in Japan. For each of 15 varieties gives: Name, year registered (1928-1991), breeding method (crossing, pure line, mutation, back-crossing), ecotype, weight of 100 seeds, seed color, hilum color, characteristics. Address: National Agricultural Research Centre, Tsukuba City, Japan.

1454. Kushi, Michio; Kushi, Aveline; Jack, Alex. 1993. *Macrobiotic diet: Revised and enlarged edition*. Tokyo and New York: Japan Publications. 400 p. Illust. Index. 21 cm. • **Summary:** Edited by Alex Jack, this is the revision of a book first printed in 1985.

The chapter on “Beans and bean products” has the following contents: Daily use. History. Quality. Varieties: Azuki beans, black-eyed peas (sometimes known as yard-long beans), black turtle beans, broad beans, chick-peas, great northern beans, kidney beans, lima beans, lentils, mung beans, navy beans, peas, pinto beans, soybeans (p. 195-99) (introduction, miso, natto, okara, soy flour, soy grits, soy milk, soy oil, shoyu, tempeh, tofu {incl. nigari, fresh tofu, soft tofu, firm tofu, deep-fried tofu, pickled tofu, fermented tofu, frozen tofu, dried tofu}), viilia, soy yogurt, yuba.

For information on cooking soy, see p. 204-07. Note: Natto is not usually made with koji (p. 207). For “Health benefits” and for “Soy foods and cancer research” (p. 208-09).

Black soybeans (also known as “Japanese black beans”) are mentioned on pages 60, 121, 189, 200, and 204.

“Natto is a fermented soybean product that resembles baked beans connected by long sticky strands. Its strong odor takes some adjusting to but once appreciated natto is enjoyed regularly as a small side dish or condiment” (p. 196).

1455. Nagai, Toshirô; Kiuchi, Kan. 1993. [Development of natto starters]. *Daily Foods Science* 13:24-30. [50+ ref. Jap]\*

1456. Okubo, Kazuyoshi. 1993. *Tôfu, nattô* [Tofu and natto]. Tokyo: Nihon Hoso Shuppan Kyokai. 189 + [1] p. Illust. 19 cm. Series: Kenkoshoku, Karada ni Naze ii No?, no. 3. [10+ ref. Jap]\*

• **Summary:** Kazuyoshi Okubo was born in 1938.

1457. Shimizu, Kay. 1993. *Tsukemono: Japanese pickled vegetables*. Tokyo: Shufunotomo / Japan Publications. 112 p. Illust. (color). Index. 27 cm. [Eng]

• **Summary:** Tsukemomo are Japanese pickled foods, primarily vegetables. Drying and pickling were two of the earliest ways of preserving food. If you’ve never tried Japanese tsukemono, get ready for a delicious surprise. This excellent book is a good place to start. We would start with takuan and umeboshi (p. 22).

Soy related recipes: Basic *miso-zuke* (p. 36-37). Spicy pickled celery (*Celery miso-garame*) (p. 37). *Koji / miso / kasu* tsukemono base (p. 39). Amazake (p. 40-41). Daikon radish pickled in koji (*Bettara-zuke*) (p. 41). Scallions in shoyu (*Rakkyo shoyu-zuke*) (p. 43). Garlic with soy sauce (p. 64). Garlic with bean paste [miso] (p. 64). Okra and onion pickles (*Okra shoyu-zuke*) (p. 70). Soy-flavored daikon pickle (*Daikon shoyu-zuke*) (p. 82, 84). Asparagus with bean paste (*Asparagus miso-zuke*) (p. 87). Spicy cabbage tsukemono (*Cabbage shoyu-zuke*) (p. 88). Cooked and pickled kelp (*Nori tsukudani*) (p. 97). Soy sauce pickled vegetables (*San-bai-zuke*) (p. 98).

A 2-page glossary includes: “Age (abura-age)—deep-fried soybean cake (*tofu*). An—sweetened red *azuki* beans prepared as a paste for confections. Amazake—non-alcoholic creamy-thick hot drink prepared from rice fermentation with the addition of rice koji.

“Drop lid. A necessary item for Japanese pickling. A wooden cover which is smaller in diameter than the pot opening, so lid will lay flat on top of food, and weight can be placed on top of lid.”

Dou-ban-jiang—spicy Chinese brown bean paste, contains chili. Koji—a yeast-like rice mold that works primarily to convert starches into sugars during a fermentation process.

Mirin—a thick sweet wine made from glutinous rice, used primarily for cooking. Miso—fermented soybean paste. Mochiko—glutinous rice flour. Mochi—glutinous rice that has been pounded until soft and sticky, then formed into cakes. Mochi-gashi—a confection made from glutinous rice.

Natto—fermented soybeans with sticky texture and strong aroma. Nori—edible seaweed, laver. Shoyu—Japanese soy sauce, considerably lighter than Chinese soy sauce, which should not be substituted for shoyu.

Suribachi—Japanese pestle and mortar (earthenware bowl with ridged edges). Tsukudani—food simmered with shoyu, sugar, mirin and water until almost all liquid evaporates.

Ume—Japanese plum; technically a species of apricot, but usually translated as plum. Umeboshi—pickled plum. Wakame—an edible seaweed, thinner and softer than konbu kelp. Wasabi—Japanese green horseradish, most familiar in the west as a mound of pungent green paste served with sushi or sashimi.

Note: Real wasabi is very expensive, and is a completely different plant from horseradish, from a different genus and species. Real wasabi is rarely found outside Japan and is much more potent than its imitation, “western wasabi”—a mixture of horseradish, mustard, and green food coloring. Address: Saratoga, California.

1458. Yanagisawa, Y. 1993. *Nattô no hon* [The book of natto]. Ibaraki, Japan: Asahi Shokuhin. [Jap]\*

• **Summary:** A chapter titled “The roots of natto,” by H. Nagayama, appears on pages 2-3. It discusses the origins of

natto, both legendary and documented. Address: Japan.

1459. *Toyo Shinpo (Soyfoods News)*. 1994. Tôfu, nattô was gan o yôbô suru? Kôka no kaime e ekigaku chôsa susumu [Do tofu and natto prevent cancer? Advancing epidemiologic research to elucidate effects]. Jan. 21. p. 11. [Jap]

1460. Shurtleff, William; Aoyagi, Akiko. comps. 1994. Soyfoods industry and market—Bibliography and sourcebook, 1985 to 1993. Lafayette, California: Soyfoods Center. 361 p. Subject/geographical index. Author/company index. Language index. Printed 11 Jan. 1994. Published Jan. 1995. 28 cm. [985 ref]

• **Summary:** This is the second of the two most comprehensive books ever published on the soyfoods industry and market worldwide.

In May 1982 the first study of the burgeoning soyfoods industry in the Western world was compiled by Shurtleff and Aoyagi, and published by Soyfoods Center. In April 1985 the fifth edition of that book, titled *Soyfoods Industry and Market: Directory and Databook* (220 pages), was published. It contained statistics through 1984, the market size and growth rate for each soyfood type, rankings of leading soyfoods manufacturers of each soyfood type and the amount each produced, analyses, trends, and projections. This book is published to update the 1985 market study.

In the decade since 1984 the soyfoods market has continued to grow at a very healthy rate, with some soyfood types (such as soymilk) growing at a truly astonishing sustained rate—in both the USA and western Europe—as the statistics in this book show so vividly. In 1975 only 75 new commercial soyfood products were introduced in the USA, yet that number skyrocketed to 217 in 1979, reaching an amazing 422 new products in 1987.

During the decade from 1984 to 1994, Soyfoods Center has invested most of its time and resources in the production of SoyaScan, the world's largest computerized database on soyfoods, which contains more than 44,500 records as of Jan. 1994. This database also includes a wealth of carefully researched statistics and analyses of the soyfoods market; those from the start of 1985 to the end of 1993 are contained in this book. Its scope includes all known information on this subject, worldwide. Its focus, however, is statistics, analyses, and trends concerning the soyfoods industry and market in the United States and Europe.

In May 1990 Soyfoods Center conducted an in-depth study of the tofu market in Europe (137 pages), and in July 1990 of the soymilk market in Europe (261 pages). All original interviews and published records from both of these market studies, plus a summary of each study, are included in the present book.

The SoyaScan database is composed of individual records. One record might be an original interview with the head of the largest soymilk company in Europe, on the

size and growth of the soymilk market in Europe, and new trends in that market, conducted by William Shurtleff of Soyfoods Center. Another might be a published article or an unpublished document concerning the growth of the market for soy yogurts or soy sauce in America.

This book documents the growth of each product category in every country worldwide. The book contains three extensive and easy-to-use indexes: A subject/geographical index, an author/company index, and a language index. These allow you to find the exact information you need on the soyfoods industry and market quickly and easily. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 510-283-2991.

1461. United Soybean Board; Nebraska Soybean Program. 1994. Designed for life: A closer look at the versatile soybean's contribution to human health (Brochure). Lincoln, Nebraska. 12 panels. 23 x 10 cm each. [1 ref]

• **Summary:** Contents: Soybean fiber. Soybean protein (in soy flour, isolates, concentrates). Soybeans: The newest and oldest of designer foods. Finding and using soybeans: Miso, tofu, natto, tempeh, full fat flour, soymilk, soynuts, soy sauce. Soybean oil: 85% unsaturated fat, no cholesterol, high in polyunsaturates, hydrogenation and *trans* fatty acids. Once upon a time (“circa 1500 BC, Yu Xi-ong and Gong Gang-shi, who were either bandits or warlords depending on your perspective...” discovered the soybean. Note: This story has no basis in historical fact). The soybean: Health insurance in a pod.

Photos show: Two hands holding up a large Chinese bowl of miso soup containing squares of tofu. A table set with dishes of various East Asian soyfoods. Charts: Bar charts showing percentage of saturated, monounsaturated, and polyunsaturated fatty acids in soybean oil and other oils and fats. Nutritional analysis of 1 cup of cooked soybeans.

Note: This brochure was developed for the United Soybean Board (USB) by the Evans Group in Seattle, Washington. It was mailed mostly to food manufacturers. Address: Lincoln, Nebraska.

1462. United Soybean Board. 1994. Soybeans: Unlocking the secret to good nutrition. Healthcare guide. St. Louis, Missouri. 8 p. 28 cm. [5 ref]

• **Summary:** Contents: A critical food source from the dawn of history. The only vegetable that contains complete protein. World soybean production (1992/93, bar chart). The most versatile food on earth. Health benefits of soy foods (discusses only soybean oil!). Nutritional analysis of soybeans, kidney beans, and peanuts. Bar chart showing the fatty acid composition of soybean oil and other oils and fats (soybean oil is “the balanced oil”). Hydrogenation and health. Cis and *trans* fatty acids. Soybean oil's place in the diet. Whole soybean foods: Tofu, tempeh, miso, natto, soy sauce, full fat soy flour, soy “nuts” and soymilk. Soybean

fiber (the outer hull). Soy protein products: Defatted soy flours, soy isolates, soy concentrates. Isoflavones (incl. Genistein). Soybeans, the “All American” legume. For more information call 1-800-Talk-Soy.

Note: This brochure was developed for USB by the Evans Group in Seattle, Washington. It was mailed mostly to dietitians, nutritionists, and members of the food industry. It focused more on soy oil than on soy protein. Address: St. Louis, Missouri.

1463. *Toyo Shinpo (Soyfoods News)*, 1994. Ibaraki no shin meisan-hin. Nattô senbei. Ibaraki-ken Kôgyô Gijutsu Sentaa [New product from Ibaraki prefecture. Natto senbei (crackers) from the The Ibaraki Prefectural Industrial Technology Center]. Feb. 2. p. 7. [Jap]

1464. *Toyo Shinpo (Soyfoods News)*, 1994. Chiba no shin meisan-hin ni pinattsu iri nattô. Igyôshu kôryû de kaihatsu hanbai. Azuma Shokuhin [Chiba prefecture promoting new natto product that contains peanuts. Two different industries exchanged information to develop and market the product, made by Azuma Foods]. Feb. 2. p. 7. [Jap]

1465. Sanger, David E. 1994. Tokyo’s tips for New York. *New York Times*. Feb. 6. p. SM28-SM29.

• **Summary:** Japan is the world champion at managing the chaos of urban life. So here are some ideas from Tokyo that America would do well to import. (3) Obasans. Every block in Tokyo has one such lady who sees that everyone on the block packages their garbage correctly. “But our neighbors give us a break, viewing our absence of training in this regard as one of those many cultural handicaps—along with a lack of appreciation for natto, a particularly potent fermented [soy] bean dish—that are beyond our control.”

Another idea is gun control; handguns are prohibited in Japan. Tokyo had a grand total of eight gun-related murders in 1992, about as many as New York City has every two days. Japanese can own rifles and shotguns but the licensing and storage requirements are very strict. Address: Tokyo bureau chief of the New York Times.

1466. *Agri-Book Magazine (Exeter, ONT, Canada)*, 1994. Far East market can double. 20(5):29. Feb.

• **Summary:** Canada is selling more and more soybeans for food uses to East Asia. Thailand is the only country in the region that is self-sufficient in soybean production. Japan (population 123 million) imports more than 1 million tonnes per year, Taiwan imports 250,000 tonnes, Indonesia 150,000 tonnes, Korea 120,000 tonnes, and Malaysia 100,000 tonnes. Singapore and Hong Kong import all the soybeans they use.

In 1993 Ontario produced a record 1.7 million tonnes. Only 500,000 tonnes of this (29.4%) was exported, and only a fraction of that was suitable for making soyfoods such as tofu, natto, soymilk, Taiwanese fermented tofu (*foo yee*),

etc. A large color photo shows ladies in Taiwan packing fermented tofu in jars.

Ontario has captured 56% of the Hong Kong market, and about 14% of the Malaysian market. But the Asian market is becoming more competitive because exporters from the USA are beginning to offer soybeans in bags as well as bulk shipments. Michael Loh, the OSGMB coordinator for export development, thinks Canada can achieve its goal of doubling soybean exports by the year 2000.

1467. *Toyo Shinpo (Soyfoods News)*, 1994. Ajia no nattô—sono genryû o saguru. Biruma, Nepaaruru nado e kuruma de tôsa. Ajinomoto Shohu (hin) no Bunka Fooramu no josei de. Tenpe-ken Watanabe zen kaichô ra 3 shi. 6 gatsu ni kenkyû seika happyô [Trying to find the roots of natto in Asia. Three researchers went to Burma and Nepal by car in search, helped by Ajinomoto Food Company’s Cultural Forum. Among them was Tadao Watanabe, former head of the Tempeh Research Society. They are planning to present their results in June]. March 21. p. 1. [Jap]

• **Summary:** Photos show the three researchers who went on the trip: Tadao Watanabe, Yoshiko Yoshida, and Toshiie Maeda.

1468. *Palawija News (Bogor, Indonesia)*, 1994. International Soyfoods Fair and the Third Asian Symposium on Non-Salted Soybean Fermentation: June 4-6, 1994, Akita City, Japan. 11(1):16. March.

• **Summary:** For further information contact: Symposium Executive Committee Director, Seiha Yamada, c/o Akita International Association Aidx Bldg., 8F, 2-1-60 Sanno, Akita, Japan 010.

Note: This symposium took place, but the symposium proceedings were apparently never published.

1469. *Toyo Shinpo (Soyfoods News)*, 1994. Mikka kakete tsukuru Edo no ippin: Kokyû senro tsuranuku Shibazaki Nattô no Amano-ya [It takes 3 days to make Edo’s {Tokyo’s} best quality natto: Amano-ya pushes its high class Shibazaki brand natto]. May 1. p. 10. [Jap]

• **Summary:** A large photo shows the outside of the plant. Ten smaller photos show key steps in the process.

1470. *SoyaScan Notes*, 1994. Foods of East Asian origin that the macrobiotic movement/community has played a leading role in introducing to America, starting in about 1960 (Overview). May 10. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** These include brown rice, rice cakes, miso (many types), shoyu (traditional Japanese-style soy sauce), tamari (Japanese soy sauce containing little or no wheat; prior to about 1980 many practitioners of macrobiotics referred to natural shoyu as “tamari,” thus inadvertently popularizing real tamari, which now may be better known

in the USA than it is in Japan), natto (fermented soybeans), seitan (wheat gluten seasoned with a soy sauce broth; this word was coined by George Ohsawa), amazake (thick rice beverage), umeboshi salt plums, sea vegetables (kombu, wakame, hijiki, nori, etc), tofu, soymilk, alternatives to dairy products (macrobiotics do not consume dairy products), buckwheat noodles (*soba*), kuzu, rice syrup, barley malt syrup, azuki beans, sesame seeds, sesame salt (*gomashio*), daikon (white radish) and daikon pickles, kabocha (Hokkaido pumpkin), shiitake mushrooms (also known as Chinese black mushrooms, they have a firm “meaty” texture), burdock, jinenjo (glutinous yam).

They have done this by starting and running many natural food companies to import, distribute, manufacture or grow these foods; by writing cookbooks and other books about these foods; by teaching classes (including many cooking classes in which these foods are used); by influencing other people to do all of the above.

The Japanese names of many of these foods have become anglicized and are now the standard English-language names.

The macrobiotic movement also played a major role in introducing “tahini” or sesame butter (a Middle-Eastern food) to America, starting with George Ohsawa’s book *Zen Macrobiotics* in 1960. Of the first 20 records in the SoyaScan database that mention “tahini,” 14 are associated with macrobiotics. Likewise, 22 of the first 50 records are associated with macrobiotics.

1471. Kushi, Aveline. 1994. Early work with tempeh (Interview). *SoyaScan Notes*. June 11. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Her first son, Norio, was born on 15 Dec. 1954. Her youngest son, Hisao, was born on 8 June 1965. Then she and Michio moved from Wellsley to Boston, Massachusetts, and started Erewhon in April 1966. In Aug. 1969 Aveline moved to Los Angeles (California), where her youngest son, Hisao, underwent traditional Japanese treatment for a bone problem. After about 2 years she and her son returned to the Boston area. At about this time, she and Michio took their first or second trip to Europe. During a visit to Amsterdam, Netherlands, she was with Adelbert Nelissen (who was a student of macrobiotics and is now running a Kushi Institute there), who took her and Michio, after a seminar, to an Indonesian restaurant. There she tasted tempeh for the first time, realized it was made from soybeans, and liked it very much—in fact much better than natto. She also realized that most Americans would like tempeh better than natto—another fermented soyfood. She told Adelbert: “You must learn how to make tempeh.” After returning to America, she sent an American man to Amsterdam to learn how to make tempeh. She also brought back tempeh and started to show it to people, and to use it, in her cooking classes in Boston. Everybody liked it. And it was easy to make. Address: 62

Buckminster Rd., Brookline, Massachusetts 02146. Phone: 617-232-6869.

1472. Olowoniyani, F.O.; Chindo, H.J.; Osho, S.M. 1994. The use of soybean daddawa processing (Abstract). In: Third Asian Symposium on Non Salted Soybean Fermentation Products. 1 p. Held 4-6 June 1994 in Japan.

• **Summary:** This paper was presented at the symposium. “Abstract: Daddawa [dawadawa] is the Hausa name for the product obtained after processing locust (*parkia*) beans. It is consumed by a majority of Nigerian households especially in the rural communities. One of the major problems in daddawa production is seed availability. Soybeans, a very nutritious and readily available seed crop has been found to be a good substitute for *parkia* beans in daddawa processing. This paper discusses the various uses and processing techniques employed in daddawa making, high-lighting the qualities of soybeans as a substitute for locust bean seeds. Special attention is focused on the activities of Samaru-Kataf Soybean Daddawa Women Processors Group in Kaduna state.” Address: 1-2. Home Economist, National Agricultural Extension Research Liaison Service (NAERLS), P.M.B. 1067; 3. Food Technologist & Coordinator, Soybean Utilization Project, International Inst. of Tropical Agriculture, Oyo Road, P.M.B. 5320, Ibadan. Both: Nigeria.

1473. *Seed World*. 1994. Soybean tailored to natto market. 132(7):58. June.

• **Summary:** Pearl, a new small-seeded soybean variety for the production of natto, was developed by Thomas Carter, USDA plant breeder stationed at North Carolina State University (NCSSU). Pearl is adapted to North Carolina growing conditions,

1474. Tamang, J.P. 1994. Kinema—a non-salted soybean fermented food of Darjeeling Hills and Sikkim (Abstract). In: Proceedings of the Third Asian Symposium on Non-Salted Soybean Fermentation. Held 4-6 June 1994 in Akita, Japan. [Eng: Jap]\*

Address: Central Food Research Lab., Babar Mahal, Kathmandu, Nepal.

1475. Belleme, John. 1994. New developments with rice beverages and natto (Interview). *SoyaScan Notes*. Sept. 16. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** At the recent Natural Products Expo on the East Coast there was a big battle of the rice beverages. Westbrae has just launched two new rice beverages in aseptic cartons with spouts; one is regular strength and the other is concentrated. This may be the first natural foods product in an aseptic carton with a spout. Imagine Foods then switched to a carton with a spout. Then Imagine Foods put out a big poster explaining why their Rice Dream is superior to Westbrae’s. John prefers the flavor and texture of Rice

Dream.

John's main business is now exporting to Mitoku. There is a big demand for organically grown soybeans in Japan. John has a standing order from Mitoku for 1,000 tons of small-seeded organically-grown soybeans to be used in Japan for making natto. Tommy Carter at North Carolina State University in Raleigh is breeding natto-type soybeans. Charles Kendall, a natto manufacturer in Massachusetts, is now testing the soybeans that Carter breeds. It is a nice relationship. Address: P.O. Box 457, Saluda, North Carolina 28773. Phone: 704-749-9537.

1476. Andoh, Elizabeth. 1994. Where Tokyo's young crowd likes to eat: Choice tables. *New York Times*. Sept. 18. p. 165.  
 • **Summary:** A look at popular restaurants in Tokyo. "One sampler is made up of five rolls of sushi—one each of tuna, omelet, natto (sticky fermented [soy] beans), mentaiko (spicy cod roe) and fresh ama ebi (shrimp).

Also mentions: "chilled cubes of silky bean curd," "miso-thickened broth with wakame, or sea tangle," "fried bean curd," "sweet adzuki beans."

1477. Takaboshi, Shinichi. 1994. Re: Natto history book. Letter to William Shurtleff at Soyfoods Center, Sept. 30. 4 p. Handwritten, with signature. [Jap]

• **Summary:** The natto history book you asked about is titled *Natto Enkakushi*. It was published on 1 April 1975 and is written entirely in Japanese. Address: Japan Natto Association, 5th Floor Natto Hall, 2-7-10 Motoasakusa, Taito-ku, Tokyo 330, Japan.

1478. Thompson, Keith. 1994. Breeding soybeans for use in making soy oil or natto at Jacob Hartz Seed Co. (Interview). *SoyaScan Notes*. Oct. 11-12. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Hartz is making more progress in fatty acid modification for the oils industry than they are in Oriental soyfoods, in two areas: (1) Increasing saturated fatty acids to about 30% so that the oil need not be hydrogenated in applications where hydrogenation (which creates *trans* fatty acids) was traditionally used; (2) Reducing saturated fatty acids to the level of canola oil; Hartz already has a "low-saturate soybean" with only 7.5% saturated fatty acids (as opposed to 6% in canola oil) but none of the oil companies are interested. They run strictly on cost and are not willing to pay a premium. Moreover, a specialty oil would require that the beans be "identity preserved" yet even a small solvent extraction plant (such as Riceland Foods in Stuttgart) has a capacity of 50,000 bushels/day. The oil companies say it will cost a lot of money to put a low-saturate soy oil on the shelf and they do not think they can gain market share. Keith hopes that Hartz can pursue this more to find a company interested in a niche market, such as an all-natural oil that is low in saturated fatty acids. The industry seems

more interested in (1) than in (2). Monsanto has concluded that it is too costly to make these changes using genetic engineering, but not too costly (and worth doing) using classical breeding.

Hartz has hired a food scientist, Dr. Keshun Liu, who is actively involved in Hartz's mutation breeding program for fatty acids. He does a lot of analysis of the oil content of these soybean mutants, using a gas chromatograph. He also does quite a lot of analysis on natto beans and a little on soybeans for tofu.

In terms of Oriental soyfoods, Hartz has for many years sold a large quantity of specialty soybeans to natto makers in Japan. They have worked closely with natto makers to breed in several characteristics that they require, such as small seed size. Hartz's Japanese partner [Yaichiro Mogi of Asahi Shokuhin] was very scientifically oriented and had good analytical capabilities. They came to Hartz and said "Here's what we want in a natto bean." Hartz bred to their specifications and it worked. Keith thinks that Hartz may have the world's biggest program for breeding soybeans for natto. Hartz's sales of natto beans constitute about 50% of the company's total sales. Hartz's soybean breeders continue to communicate with natto makers (more than does Hartz's food scientist) but there doesn't seem to be a lot of change in terms of what they are looking for in a good natto soybean.

Natto makers are willing to pay a good premium for their soybeans because natto beans are inherently lower yielding and have many special characteristics that are difficult to breed and select for. The breeder must get high yield and disease resistance for the farmer plus 3-4 characteristics desired by the natto makers. Address: Food and Export Manager, Jacob Hartz Seed Co., P.O. Box 946, Stuttgart, Arkansas 72160. Phone: 800-932-7333.

1479. Thompson, Keith; Brown, Edward. 1994. Breeding soybeans for use in making tofu at Jacob Hartz Seed Co. Part II (Interview). *SoyaScan Notes*. Oct. 11-12. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The second problem is that the science of breeding soybeans for tofu is not well understood. We still don't understand the basic theory as to what constitutes a good soybean for making tofu—a good tofu bean. What are the main compositional factors that affect tofu yield, flavor, and consistency (hardness or softness). It is not clear what characteristics breeders should select for when breeding tofu beans—except for the bean's physical appearance. Keith has a very close Japanese contact who is doing excellent work at a lab in a university in Japan, trying to understand what causes one soybean to be better than another for making tofu. He has made a lot more progress than Hartz has, and his work is quite confidential. Hartz has tried to get permission from the Japanese for Dr. Keshun Liu to visit that lab, but they won't even talk about it. Keith's talks about this university researcher with Takashi Matsumoto, who is in a large

trading company, but he doesn't recall the name of the tofu researcher at the university. The trading company is funding the research and is very forward looking.

The third problem is that the Japanese who buy soybeans that will eventually be used for making tofu have a number of strong preconceptions about the way these soybeans should look—regardless of the amount and quantity of tofu that can be made from them. They want a soybean with very large seed size (less than 2,000 seeds/lb), a clear hilum, and dull-luster—that looks like it is a typical soybean grown in Japan. If the soybean doesn't look like that, they don't care how good the tofu yield or flavor are. The Japanese seem to prefer what are called “Vinton-type” soybean varieties for making tofu. These include Vinton [a Midwest variety introduced in 1978 by breeder Walt Fehr and Iowa State University] and Harovinton (from Harrow, Ontario, Canada). These are large-seeded clear hilum beans [perhaps traditionally called vegetable-type soybeans]. “Vinton-type” soybeans now sell (cleaned and in bulk) for only about \$0.80 to \$1.75 over the Chicago Board of Trade (CBOT) price. That is not enough of a premium to attract Hartz. Hartz has developed on soybean that seems to have excellent characteristics for making tofu. But the Japanese don't want this soybean because it doesn't look like what they are used to. It is oblong and not as uniform as usual.

Eddie Brown hasn't given up on tofu beans; he is doing a lot of work and making a lot of crosses. Hartz has 40 acres of a variety it will be harvesting in the next 2-3 weeks and releasing next year that was selected primarily based on seed size, but also protein content. This line is quite large seeded, with 1,400 seeds/lb. Yet agronomically, it is a second or third class variety, so Hartz must charge more for it to counterbalance its lower yield. It is difficult to grow large-seeded soybeans in the south since it is generally true for soybeans that the further you go north and the earlier the maturity group, the larger the seed size and the more the percentage of clear hilum varieties. Some of this is genetic and some environmental. Varieties north of Boothill, Missouri are usually indeterminate, whereas those to the south are determinate. Determinate plants grow to a certain height and then start blooming; indeterminate varieties start blooming when the plants are very small and bloom until they reach normal plant height.

Keith thinks that true Vinton is not grown much any more. The new Vinton-types, developed by Midwest breeders, look like a Vinton but the yield is much better for the farmer. These Vinton-types sell for about \$0.80 to \$1.75 over the CBOT price.

One reason the Japanese may be demanding Vinton-type soybeans having a certain appearance is so that they can blend our \$8/bushel beans with their domestic beans [Nihon Daizu], which are much more expensive, then sell the blend as if they were all Japanese-grown soybeans.

Japanese are limiting themselves greatly by demanding

large-seeded soybeans. Eddie has only 10-15 breeding lines available to him in large-seeded soybeans compared with 2,000 to 3,000 lines of regular-sized soybeans. Breeders in the Midwest have a much larger germplasm base to work with on large-seeded clear-hilum varieties.

Hartz would like to have more of its soybeans grown organically because they could get a huge premium for those soybeans—no doubt about it. Hartz is already producing some organic natto beans, primarily with one big rice grower who is OCIA certified. His main crop is rice, and he has his own rice mill, rice bagging, and rice marketing system. Most rotations in the South are based on either rice or cotton. It is very difficult to find organic acreage in the South unless you find a rice farmer who is philosophically committed to organic farming [like Carl Garrich of the Lone Pine in Arkansas]. Even if Hartz offers farmers a premium of \$4/ bushel over the CBOT price they are not interested. It doesn't work well with a rice rotation.

Once a soybean seed company makes the commitment to breed soybeans for tofu, it must develop at least a small bench-top tofu-making system in order to quantify and compare different varieties. You need a program and a systematic way of making tofu and measuring the results. You must be able to prove that one soybean is significantly better than others for making tofu—in terms of yield, or flavor, or fat content, or genistein level, whatever. This becomes the basis of marketing the soybean to tofu makers. Address: 1. Food and Export Manager; 2. PhD, Soybean Breeder. Both: Jacob Hartz Seed Co., P.O. Box 946, Stuttgart, Arkansas 72160. Phone: 800-932-7333.

1480. Roller, Ron. 1994. Breeding soybeans to use for making soymilk in America. Part II (Interview). *SoyaScan Notes*. Oct. 13. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** How often does Ron change the soybean variety he uses? He has several base varieties, which are kept secret and which he tries to build on. Every year he tries to find new soybean varieties which are like the base varieties but which will grow in other geographic areas. Moreover the acreage for a particular variety must be expanded slowly as it proves itself both agronomically and from a food point of view. When Ron contracts with a farmer he contracts bushels, not acres. That is, guarantees to pay a certain amount per bushel if the farmer plants a certain number of acres, never just a certain amount per acre planted. This way, both sides take a risk: If the farmer has a large yield, then Ron must buy more soybeans than he wants to. ASP has been hurt before by contracting acres, when there was a flood or frost. Each farmer must get certified, which pretty much guarantees that he has grown the soybeans organically. After a while, ASP knows which growers it can trust, and they become part of ASP's steadily expanding grower base or network.

There are probably very few U.S. soyfood manufacturers that have enough volume that they need to contract directly with farmers. But those that are big or have a large need for organic soybeans must contract directly with farmers to assure themselves an adequate supply of the type of soybeans they want.

Ron would be very interested to know more about how the composition of a soybean affects its flavor. He has a good deal of respect for Pioneer Hi-Bred Seed Co. He thinks they have good seeds, a good staff and research department, and a good distribution system. And they have generally been reliable. They have helped Ron find soybeans for certain growing areas that they sell. He likes the fact that they are national, spanning the breadth and width of the U.S. soybean growing area, and selling all maturity groups. However, 3-4 years ago, Pioneer Seed Co. got into the cultivation, cleaning, bagging, and export of organic soybeans—with their Better Life program (no pesticides or herbicides, but they can use chemical fertilizers). So they began to compete with Ron for organic farmers to grow their seeds, and they pay the farmers more than Ron does.

Pioneer has a pretty extensive base of soybean customers in Japan for regular soybeans, Better Life soybeans, natto beans, large-seeded soybeans, and organic soybeans. Their Specialty Crops Division has penetrated the Japanese market in many areas. Their employees travel frequently to Japan, they speak Japanese, they have an office there, and they're plugged in. They study those industries in Japan, find out what they want, then they come back and try to breed that into a soybean. As far as Ron can tell, Pioneer is the leader in breeding soybeans for food uses in terms of both volume and specific varieties.

Another company doing research in this area is Jacob Hartz Seed Co. in Arkansas. They are working on some large-seeded soybeans but they are having a lot of trouble. Ron has a low opinion of the soybeans Hartz breeds for making natto; he studied that market intensively.

There has been a demand from Japan to supply some organic beans, so many of the U.S. companies that supply soybeans to Japan have begun small organic programs (not because they want to—they hate it), just to satisfy their Japanese customers. Even though Mitsui or Mitsubishi or Marubeni don't want a lot of organic soybeans, they want enough in a tight market to drive the price way up. It was because of the Japanese demand plus a small soybean crop that organic soybean prices were so high in 1994. Country Life went out of business, with unpaid debts of \$400,000 to \$500,000. Some of the farmers formed cooperative marketing groups; they grow varieties desired by the Japanese, and pool their resources in cleaning and bagging, so they can export containers to Japan and eliminate U.S. middlemen or soybean brokers. Ron feels the price for organic soybeans will stabilize at about \$10-\$12 per bushel.

If Ron worked closely with a soybean breeder and

seed company, he would want the right for the farmers with whom he contracts to be able to buy the seed from the seed company. His company is unique in having a large number of cooperating organic growers, and that gives ASP the lowest price and highest quality. If Ron contacts the growers early and tells them what ASP will pay per bushel of organic beans, that becomes the standard base contract price for other companies too. Word travels fast. Nichii buys directly from soybean farmers, but Ron thinks Vitasoy buys from a middleman (a soybean broker or trading company such as Pacific Soybean and Grain). Some soyfoods manufacturers buy through soybean brokers—the biggest of which are Pacific Soybean and Grain, American Health and Nutrition, and Purity Foods. Domestic soyfoods manufacturers get deluged with calls from farmers who want to grow soybeans just for them at a premium price and sell direct without a middleman. The middlemen or soybean brokers tend to survive on export business.

This is a very complicated issue—particularly seen from the viewpoint of a seed company that wants to breed better soybeans for food uses. Address: President, American Soy Products, 1474 N. Woodland Dr., Saline, Michigan 48176. Phone: 313-429-2310.

1481. Davi, K. Kundala; Devi, G. Ibemhal; Singh, -. 1994. 10. Bacterial flora in hawajjar (Fermented soybean). *Proceedings of the Indian Science Congress* 81(Part IV):69.\*

• **Summary:** “Hawajjar, the fermented form of soybean is a favourite and popular food item in Manipur.” Address: 1. Aerobiology, Microbiology and Plant Pathology Lab., Dep. of Life Sciences, Manipur Univ., Canchipur 795 003, India.

1482. Esaki, H.; Onozaki, H.; Osawa, T. 1994. Antioxidative activity of fermented soybean products. In: M.T. Huang, ed. 1994. *Food Phytochemicals for Cancer Prevention I, Fruits and Vegetables*. Washington, DC: American Chemical Society. SCS Symposium series 546-547. See p. 353-60. Index. 24 cm. [Jap]\*

• **Summary:** “Developed from a symposium sponsored by the Division of Agricultural and Food Chemistry at the 204th National Meeting of the American Chemical Society, Washington, D.C., August 23-28, 1992.” Two volumes.

1483. Sarkar, P.K.; Tamang, J.P.; Cook, P.E.; Owens, J.D. 1994. Kinema—a traditional soybean fermented food: Proximate composition and microflora. *Food Microbiology* 11:47-55. [31 ref]

• **Summary:** Kinema (the name is Nepali) serves as a meat substitute for the majority of people in the eastern Himalayas. The average moisture content of kinema was 62%. On a dry weight basis, kinema contained about 48% protein, 28% carbohydrate, 17% fat, and 7% ash. The energy value of 2.0 MJ/100 gm (MJ = mega-joules).



The pH of kinema is distinctly alkaline (average 7.89), whereas the pH of raw soybeans is neutral to slightly acidic (average 6.75). The free fatty acid content of kinema was about 33 times higher than that of raw soybeans. "A total of 502 bacterial strains representing *Bacillus subtilis* and *Enterococcus faecium* and 198 yeast strains representing *Candida parapsilosis* and *Geotrichum candidum* were isolated from 50 samples of kinema."

Kinema is now popular among the Lepchas who call it *satyangser* and among the Bhutias who call it *bari*.

Note: This is the earliest document seen (Feb. 2012) which states that "satyangser" is the Lepcha name for Nepalese kinema, or that "bari" is the Bhutia name for Nepalese kinema, a close relative of Japanese natto. Address: 1-2. Microbiology Lab., Centre for Life Science, Univ. of North Bengal, Siluria 734 430, District of Darjeeling, West Bengal, India; 3-4. Food Microbial Interactions Lab., Dep. of Food Science and Technology, Univ. of Reading, P.O. Box 226, Reading RG6 2AP, UK.

1484. Sarkar, P.K.; Tamang, J.P. 1994. The influence of process variables and inoculum composition on the sensory quality of kinema. *Food Microbiology* 11:317-25. [24 ref]  
 • **Summary:** Kinema, a traditional fermented food, is made at home in a crude manner. The natural fermentation process usually results in an acceptable product, but inconsistencies and spoilage often occur. In order to standardize quality, the traditional process variables were optimized by sensory evaluation. Microorganisms: A pure culture of *Bacillus subtilis*. Wrapping material: A thinly perforated polyethylene bag. Cooking time and pressure: 10-15 minutes in 7 kg per square cm steam pressure. Fermentation time and temperature: 48 hours at 37°C.

Preference trials by consumers showed that kinema produced under the above optimum conditions was more acceptable than market samples with the highest scores. Address: Microbiology Lab., Dep. of Botany, Univ. of North Bengal, Siliguri-734 430, Darjeeling District, West Bengal, India.

1485. Karki, Tika. 1994. Food processing industries in Nepal. In: K. Komogata, T. Yoshida, T. Nakase, and H. Osada, eds. 1994. Proceedings of the International Workshop on Application and Control of Microorganisms in Asia. Japan: The Institute of Physical and Chemical Research, and Japan International Science and Technology Exchange Centre. See p. 71-81. \*  
 Address: Chief, Food Research Office, CFRL, Kathmandu, Nepal.

1486. Nagano Chushin Agricultural Experiment Station. 1994. Summary of soybean breeding activities in Nagano. Nagano prefecture, Japan. 6 p. [Eng]  
 • **Summary:** Page 3 contains an excellent map titled

"Soybean Research Network in Japan." It lists and shows each of the 6 soybean breeding centers, the 7 experiment stations for testing specific characteristics, and the 15 experiment stations for testing local adaptability. Graphs show precipitation and average air temperature year-round at 5 of the main stations. The chief soybean breeder is Nobuo Takahashi. This station has developed and released 16 registered and 6 non-registered soybean varieties between 1962 and 1991; the most famous are Enrei (released in 1971), Tanrei (1978), Tamahomare (1980), Tachinagaha (1986), Ootsuru (1988), Ayahikari (1991).

Breeding objectives: 1. High yielding ability: more than 4.5 tonnes/ha in experimental fields. 2. Late planting adaptability: more than 3.0 tonnes/ha after winter wheat. 3. Suitability for mechanical harvesting: lodging resistance, non-shattering, lowest pod weight. 4. Resistance to diseases and nematodes: Soybean mosaic virus, soybean cyst nematode, black root rot, purple seed stain. 5. Seed quality: large seeds (more than 30 gm per 100 seeds), small seeds for natto (less than 10 gm per 100 seeds), appearance (hilum color, seed coat cracking, etc.), high protein (more than 45%), suitability for food processing. 6. Soybean varieties for special [food] use: Black soybean for kuromame, green soybean for kinako, large and flat soybean for hitashimame. Address: Shiojiri, Nagano prefecture, Japan.

1487. Shannon, Dennis A.; Kalala, M. Mwamba. 1994. Adoption of soybean in sub-Saharan Africa: A comparative analysis of production and utilization in Zaire and Nigeria. *Agricultural Systems* 46(4):369-84. [18 ref]

• **Summary:** A survey was conducted of soybean production and utilization among 115 soybean farmers in Gandajika, Eastern Kasai Region, Zaire. Average production per farmer in the previous season was 73 kg, which was either consumed within the household or sold. Much of the soybean production (42.6%) was consumed by humans, primarily as roasted whole soybeans (81%) [soynuts], or the full-fat flour was used as an additive to a maize porridge (80%), or to *nshima* [pronounced "SHEE-muh, also called *bidia*; a popular thick non-fermented mush or paste made from maize and cassava flour, that is often eaten with the fingers] (60%), or as a substitute for milk in tea or coffee (35%), or mixed with the vegetable eaten with *nshima*. Farmers ranked soybean second among grain legumes in area cultivated and fourth for total sales. Most farmers considered marketing the principal constraint to increased production.

A bar chart (p. 372-73) shows that 3 of the farmers surveyed first began cultivating soybeans during the 1950s. Most (72%) began growing soybeans between 1984 and the date of the survey, April 1987. The increase in new soybean farmers since 1984 seems to be related to increased seed multiplication at the agricultural experiment station. The increase in new soybean farmers in the late 1970s might be attributed to the release of variety SJ 127, which was adapted

to local conditions.

In the second part of this paper, titled “Soybean adoption in Nigeria” (p. 377+) survey results from Zaire are compared with results of similar surveys conducted in two geographically and culturally distinct areas of Nigeria. In Benue State the Tiv tribe began growing soybeans about 50 years ago [i.e., about 1944]. After the Nigerian Civil War in 1967, the soybeans were sold to women in southern Kaduna State; they processed the beans into daddawa, a fermented condiment traditionally made from the locust bean. Around 1986, soybean production spread into non-Tiv areas of Benue State, and tonnage expanded. In Oyo State, the expansion of soybeans in Ayepe and Igangan is examined.

The author then compares soybean adoption in Zaire and Nigeria, showing six elements that the four case studies have in common. Page 382 notes: “As a food, soybean competed only minimally with other grain legumes... Of the soy foods consumed in Zaire, only roasted soybean grain is, however, in any way similar to a traditional legume food, roasted peanut. In Nigeria, soybean competes with seed of the locust tree and with melon seed. In both cases, however, the use of soybean saves time and money.”

The authors conclude that this research “refutes the common misconception that soybean is not appropriate for sub-Saharan Africa... As shown in this paper, efforts to introduce home consumption of soybean were successful. It is reasonable to conclude that the introduction of soybean into new areas of sub-Saharan Africa can succeed provided that information on soy food preparations that are compatible with local foods and preparation methods are provided at the same time.” This research was financed by the USAID. Address: 1. Dep. of Agronomy and Soils, 202 Funchess Hall, Auburn Univ., Auburn, Alabama 36849-5412; 2. Institut National pour l’Etude et la Recherche Agronomique, B.P. 2037, Kinshasa I, Zaire [Formerly at Dep. of Plant and Soil Sciences, Tuskegee Univ., Tuskegee, Alabama 36088]. Phone: 205-844-4100.

1488. Suzuyo Kogyo Co. Ltd. 1994. [Soybean selection washing, automatic steaming, filling / packaging systems (Leaflet)]. In: Pamphlets on Performance of Factory Automation by Suzuyo’s High Quality Steam System. Tokyo: Suzuyo Kogyo Co. Ltd. [Jap]\*

1489. Wilcox, James R. 1994. Soybean genetics and breeding. In: Charles J. Arntzen and Ellen M. Ritter, eds. 1994. Encyclopedia of Agricultural Science. 4 vols. San Diego: Academic Press. See vol. 4, p. 181-92. Illust. Index. 29 cm. [4 ref]

• **Summary:** Contents: Glossary: Cultivar, F1, F2, F3, etc., genotype, heritability, inbred line, linkage group, phenotype, restriction fragment length polymorphism (RFLP), transgenic plants.

Introduction. Qualitative genetics. Quantitative genetics:

Heritability traits, interrelationships among traits. Sources of genetic variability: U.S. soybean germplasm collection, cultivars and breeding lines, transgenic plants. Breeding objectives for soybean: Seed yield, plant maturity, plant height, lodging resistance, seed size (Typical seeds range from 100 to 200 mg / seed. Very small seed, 80 to 100 mg, is preferred for the production of natto. Large-seeded cultivars, 180 to 250 mg, have traditionally been preferred for making tofu), seed oil content, seed protein content, disease resistance, nematode resistance, insect resistance. Breeding methods employed: Pedigree method, single-seed descent (presently the most commonly used breeding method), early generation testing, backcrossing, recurrent selection. Performance testing of improved germplasm. Increase and distribution of new cultivars: “Soybean cultivars are maintained and distributed through seed certification programs with four classes of seed to maintain cultivar purity and identity”: (1) Breeder seed, produced and controlled by the breeder. (2) Foundation seed, initially produced from breeder seed. (3) Registered seed, produced from either breeder or foundation seed. (4) Certified seed, produced from registered seed.

Tables show: (1) Genes controlling traits of economic importance in soybean. (2) Heritability estimates in percentage for quantitatively inherited traits in progenies from different soybean crosses. (3) Estimates of phenotypic correlations of seed yields with other traits in progenies from six soybean crosses.

Figures show: (1) Scatter plot—The inverse relationship between seed protein and oil content in a cross between two named parents. Address: USDA Agricultural Research Service, Indiana.

1490. Rosas, Juan Carlos; Young, Roberto A. 1994? El cultivo de la soya. Quinta edición [The cultivation of soya. 5th ed.]. *Departamento de Agronomía (Zamorano, Honduras), Publication No. AG-9603*. 68 p. Undated. [Spa] • **Summary:** Contents: 1. Overview: Economic importance, chemical composition, history, taxonomy. 2. Morphology of the soybean plant. 3. Physiology of the growth and development of the soybean plant: Stages of development. 4. Environmental factors that affect the cultivation of soya: Soil, water, irrigation, light / photoperiod, temperature, period of growth. 5. Practical cultivation: Preparation of the soil, time of planting, density of planting, quantity of seeds, systems of cultivation, control of weeds (methods of weed control, chemical control). 6. Mineral nutrition of soybeans (and inoculation). 7. Diseases that affect the cultivation of soybeans and their management: Bacterial, fungal, viral, other, seed treatment. 7. Insects that attack soybeans. 8. Harvest and storing. 10. Improvement of soybeans. 11. Processing and utilization: Industrial processing (extraction of oil, soy flours, soy protein concentrates {*concentrados proteicos de soya*}, soybean cake). Direct consumption:

In the Far East, the soybean is consumed in the form of fermented and non-fermented foods. Fermented foods include shoyu, miso, mato [sic, natto], and tempeh, while non-fermented foods include soymilk (*la leche de soya*), tofu, yuba (*juba*), and kinako. 12. The cultivation of soya in Honduras (history).

In 1972, the Ministry of Natural Resources (*Ministerio de Recursos Naturales*) reported the initiation of commercial soybean production on a small scale in various departments of the country (Olancho, El Paraíso and Comayagua). Three varieties were used at that time: Biloxi, Hardee and Jupiter. However, before these reports were made, at the Panamerican Agricultural School (*la Escuela Agrícola Panamericana (EAP)*), some hectares had already been planted with the varieties Jupiter and Pelican. Discusses additional developments in 1974, 1982, 1986, 1987, and 1988. Address: 1. PhD; 2. PhD.

1491. *Nikkei (Tokyo)*. 1995. Natto producers relying on health claims, milder varieties to attract converts. Jan. 2. [Eng]

1492. Mindell, Earl. 1995. Earl Mindell's soy miracle. New York, NY: Simon & Schuster. A Fireside Book. 256 p. Index. 22 cm. [97 ref]

• **Summary:** Contents. Part I: Soy—The miracle food. 1. The soy story: explaining the miracle. 2. Soy by any other name. 3. Does soy prevent cancer? 4. Heart and soy. Part II: Soy for special needs. 5. Just for women: Rx for menopause and osteoporosis. 6. Just for men: Rx for prostate problems. 7. Kids, cancer, and heart disease. 8. Tips for vegetarians. Part III: Not by soy alone. 9. Thirty-seven miracle foods from the Pacific Rim. Earl's pearls: A guide to vitamins and minerals. Part IV: Get more soy in your life. 11. Savvy substitutions. 12. Cooking with soy. 13. Breakfast the soy way. Part V: Seventy super soy recipes (p. 149-230). Glossary. Resources. Selected bibliography.

Pages 12-13 note that soybeans are an abundant source of many different types of phytochemicals, including isoflavones, genistein, protease inhibitors, and phytic acids.

Chapter 2 describes the different types of soy foods. Traditional soy foods: Soy milk, tofu (firm tofu, silken tofu, yakidofu, koyodofu [sic, koya-dofu]), okara, natto, tempeh, miso, soy sauce, kinnoko [sic, kinnako] flour. Soy protein products: Soy protein concentrates, soy protein isolate, soy flour, texturized soy protein, meat analogs. Other soy products: Soy fiber, soybean oil, lecithin. Questions about soy foods. Page 33 asks the question: "If phytochemicals in soybeans are so healthy, why can't they be extracted from food and made into a pill like a vitamin?" Answer: Researchers are not yet certain which phytochemicals are the most important. "There may even be other beneficial compounds in soy that have yet to be identified. Your best bet is to eat the real food." A section titled "Soy's top ten benefits" (p. 36-38) discusses: 1. Antioxidant. 2. Breast

cancer. 3. Cholesterol lowering. 4. Colon cancer. 5. Hip fracture. 6. Hot flashes. 7. Immunity. 8. Kidney disease. 9. Lung cancer. 10. Prostate cancer.

Chapter 3, titled "Does soy prevent cancer?" discusses six compounds which cancer researchers believe may be effective in cancer prevention: Isoflavones, genistein, daidzein, protease inhibitors, phytic acid, and saponins. A long section later in the chapter discusses each of these, with special emphasis on genistein.

Note: The author has also written *Earl Mindell's Herb Bible* and *Earl Mindell's Food as Medicine*. He is a newcomer to this field. This book may appeal to those who are looking for miracles from the foods they eat. Most of the information contained in this book can be found in Mark and Virginia Messina's outstanding *The Simple Soybean and Your Health* (1994), and the *First International Symposium on the Role of Soy in Preventing and Treating Chronic Disease: Proceedings from a symposium held in Mesa, Arizona, on February 20-23, 1994*, published in full in *The Journal of Nutrition* Vol. 125, No. 3S, March 1995 Supplement. It was from this symposium and the outline published before the symposium that Mindell got his idea for this popular book.

Dr. Mindell is an R.Ph. (Registered Pharmacist) with a PhD in Nutrition from Pacific Western College in Renton, Washington.

According to a review of *Earl Mindell's New and Revised Vitamin Bible*, by James A. Lowell, PhD. (Nutrition Forum, June 1986) "Mindell claims to hold valid credentials in nutrition. Although he does have a bachelor's degree in pharmacy from the University of North Dakota, his Ph.D. is from the University of Beverly Hills, an unaccredited school which lacks a campus or laboratory facilities." Mindell helped to found the Great Earth chain of vitamin and health food stores, numbering about 200 in 1986, America's second largest such chain. Address: R.Ph, PhD, registered pharmacist and Prof. of Nutrition at Pacific Western Univ. in Los Angeles. He lives in Beverly Hills, California.

1493. Ham, P. Marc. 1995. The work of Semences Program Inc. (Micronisation Canada Inc.) in Quebec (Interview). *SoyaScan Notes*. Feb. 1. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** This company was established in 1980 and is now a leader in Canada in the field of value added soy products. About two-thirds of their business is making full-fat micronized soybeans for use in animal feeds (mainly dairy cows, plus hogs and poultry), and one-third is in breeding and growing soybean seed (they presently grow about 2,000 acres year for use as soybean seed). They now have two micronizing plants which produce the Micro Flake, the Micro Milled product and the Micro Elite (made from higher protein soybeans, with high bypass). Mark believes that a micronized product makes better feed than that produced on a low cost extrusion cooker. Extrusion may

be better for monogastric animals than it is for dairy. They have a research and development program for new soybean varieties. They also contract with a winter nursery in Chile for reproduction during the winter. They buy about 55,000 tonnes/year of soybeans for processing into animal feed and for exporting to the Pacific Rim. They are one of the largest companies in Quebec that buy soybeans and keep them in Quebec. The big trading houses buy soybeans then export them mostly to Rotterdam, Netherlands, to the European crush market. Prograin keeps its Maple Glen varieties identity preserved. They screen soybeans to sort them into 3 sizes. The big beans (18/64 inch and over) are sold to Japan for use as green vegetable soybeans, the medium sized beans (500 tonnes/year) are used in the Chinatown in Quebec to make tofu and soymilk, and the small soybeans are used by 3 companies for making soy sprouts in Quebec. They have a natto program as well. Address: Semences Prograin Inc. (Micronisation Canada Inc.), 145 Bas Riviere Nord, St-Cesaire, Quebec, J0L 1T0, Canada. Phone: (514) 469-5744.

1494. Lombardi, Joyce. 1995. Re: History of growing and using soybeans in Chad. Letter to William Shurtleff at Soyfoods Center, Feb. 4. 3 p. Typed, with signature. [Eng] • **Summary:** “Thank you for your response and enthusiasm for our soya work in Chad. I am forwarding your letter to people in town who are very involved in spreading the good bean throughout the land. One, an agronomist from Togo named Dr. Akintayo, has come to Chad for soy propaganda only. He has recently produced a book which will be of great interest to you, and is also very involved in training soybean trainers at the *Centre de Formation Professionnelle d’Agriculture (CFPA)*, a farm extension service launched about 6 years ago by Swiss development workers.

“It is in fact from a Swiss-Italian development worker that I got the idea, and later the seeds, for soybean cultivation in my village. I had enjoyed ginger-flavored soymilk at his villa, and had heard him extoll the soil-enriching properties of the soy bean, so when people in my village began complaining about the low rates they were getting from the state’s cotton company, I asked if they had thought about planting another cash crop, like soy. I was told it had been done in the past, but people here don’t really know how to do much with soy beyond what you call dawa-dawa, fermented sauce. So a few weeks later, after more discussions with villagers, who told our health team that famine was their biggest health worry, the *Comite de Sante de la Paix* was born. Its mission—to grow, sell, and popularize the soybean in the village of Bessada, Chad.

“As far as I can tell, the farthest back anyone can remember planting soy in our region of southeastern Chad is 10 years ago [i.e. in about 1985]. Most people credit the above-mentioned CFPA with introducing the crop here 6 years ago. From its base in town, the CFPA also has several outposts in smaller towns (i.e. Koumra) and villages (i.e.

Modjibe) near, or within a 20 km radius of Bessada. Farmers report success with the crop, especially as our soil is ‘tired’ from a constant rotation of cotton, millet and peanuts. People report that one 100 kg sack fetches between 23,000–50,000 cfa (\$41-90) compared to half that for a sack of millet. The main buyers seems to be ONGs run by ex-pats [expatriates] or missions. Local buyers make dawa-dawa, or *ndi*, as it is called in the Sara language here, and several women in my village report making sojateen, or soybean coffee. However the cost, between 150-500 cfa per kg is prohibitive, and soy is still seen as a luxury food here. For comparison, millet is about 50-100 cfa/kg, and peanuts a bit less. Nonetheless, people generally know that soy is good for the body and soil, and were very interested in our collective soybean field.

“So, on July 17 1994, our rather ad hoc health team—made up of four men previously elected as village health delegates and 10 ten traditional birth attendants, old women with lined, tribal-scarred faces, canes, strong wiry hands—planted 6 kg of soybeans on a cleared ½ hectare plot, known here as a corde... Millet and cotton had been planted on our plot before, the debris cleaned away with the usual bushfire method.

“Our yield, just barely over 100 kg, was dismal. Reasons: we planted too late in the rainy season, which begins in May/June, and harvested our beans on Thanksgiving Day. Akintayo informed me that we planted the 120-day variety, which is what the CFPA has made available to folks here. Also, we only weeded twice, and very late in the game. The tribulations of collective labor as I’m sure you remember from your Peace Crops days. Third, our soil is rather sandy, and I’m told soy prefers clay and shade. Indeed, we remarked that the plants growing in the shade of a karite tree produced very well while the plants in the shade of an ndil tree produced a lot of foliage but not much bean. A farmer 7 km away reported a yield of 250 kg from 4 kg of seeds on a one-corde plot. He planted earlier and had better soil. His village has a water table of 23 meters, ours is 47.”

“So, now, the sack of beans sits in my hut, away from mice and thieves, until we move it to a communal silo with another sack we’re buying on credit. We have siphoned out some of the beans already to stage a big village-wide soybean transformation day, January 25, run by two animatrices sent by the CFPA in nearby Koumra. The two women journeyed out on their red moped to teach the health committee members, representatives from church and women’s groups, 25 total participants, to make soy milk, cheese (tofu), fried tofu, beignets (spicy tofuburgers made with the residue [okara] whose name in Japanese I saw in your Book of Tofu), cake, steamed pate with fish and tomatoes, sweet donuts, and cake. The consensus was: porridge (I forgot to mention it above), spicy beignets and cake. Those were the big hits. People were shocked that one could bake a delicious cake there under the mango tree outside our clinic. Our tools were 3-rock fires, wooden

mortars, big iron cauldrons and manual labor. Perhaps Niger was the same way, but Chad has next to nothing in the way of time-saving tools. We did manage to borrow someone's hand-cranked meat grinder to make the soy milk.

"The fallout from soyday is this: the chef du canton, in whose compound I live, wants to make our village a center for soya cake, and we plan to serve it to the US Ambassador and Minister of Health who are due out in the village next week to inaugurate our newly renovated clinic, *grâce à* USAID. New members of the health team want to launch an infant-feeding program of soy porridge at the dispensary each Saturday or vaccination day. There is one such program started by a French doctor named Dr. Magguie Negri in a village called Bekemba, about 60 km north of here. She started the program in 1991, and reports feeding 103 children in 1993, on a continued basis. She encourages mothers to prepare the soy meals (porridge) themselves, and to aid with a community soycrop. (Paperwork to follow if I can find any).

"The infant nutrition program couldn't come at a better time for Bessada which now finds itself in the midst of a fatal measles epidemic, compounded by the beliefs that vaccinations give AIDS and measles and that giving meat to a baby or child with measles will make her sicker.

"So, in my village, soybeans are growing fast and well, and I will leave here knowing that at least I have made a substantial contribution to the well-being of a place it seems that history has forgotten. God, it's hard here. People scrape a living out of the sand with their bare hands."

"So. The gospel spreads forth. Having seen the damage wrought by so many other egos and programs come here to save the Africans, plugging away for The Soybean is one of the only acts of development I really feel comfortable engaging in.

"So no, in answer to your question, soybean cultivation is not a specific Peace Corps program or govt. program here."

"As for me, I was a Vanilla Edensoy and tahini tofuburger fan back in the States, but I never knew much about soy until now."

Color photos taken by Joyce show: (1) Three African men weeding a field of soybeans by hand, Sept/Oct. 1994. (2) Soybean plants in Bessada growing in the shade of a Karité tree, Aug. 1994. (3) Four Africans (two in traditional dress) from the health team seated outside of Joyce's round mud-walled house with conical thatched roof. Atop a wooden mortar are five glasses of soybean coffee on a white plate. Enclosed is a recipe for "Bessadonian soya coffee deluxe," by Joyce. Season, if desired, with *tumba* (Arabic tea spice). It's cheap, nutritious, and you can eat the grounds. Address: U.S. Peace Corps, B.P. 193, Sarh, Chad.

1495. Arnold, Kathryn. 1995. The joy of soy. *Delicious!* (Boulder, Colorado). Feb. p. 34-36. [3 ref]

• **Summary:** The soybean "has long been revered by vegetarians as a nutritional powerhouse. However, the real secret is that soyfoods may help prevent disease." They are cancer fighters and good for the heart. A table (p. 36) lists 12 different types of soyfoods and their uses: Tofu, tempeh, okara, miso, natto, TVP, soymilk, soy grits, soy flour, soy cheese, soy sauce, soy yogurt.

Note: This periodical, which began publication in about 1983, is published for natural products consumers by New Hope Communications in Boulder, Colorado. As of March 1998 some 425,000 copies of *Delicious!* are distributed each month to over 900 health food retail stores throughout the United States.

1496. Hara, Toshio; Saito, Hiroyuki; Iwamoto, Nobuhide; Kaneko, Shinji. 1995. Plasmid analysis in polyglutamate-producing *Bacillus* strain isolated from non-salty fermented soybean food, *kinema*, in Nepal. *J. of General and Applied Microbiology (Tokyo)* 41(1):3-9. Feb. [17 ref]

• **Summary:** Reports that the plasmid of *Bacillus subtilis* (*natto*) isolated from Japanese natto resembles that of *Bacillus subtilis* isolated from thua nao (of Thailand) and kinema (of eastern Nepal and environs).

Note: This issue is dedicated to the memory of Kin-ichi Sakaguchi (1897-1994); he died on 9 Dec. 1994 at age 97. A memorial appears on pages 1-2; a full-page portrait photo faces page 1. Address: 1-3. Microbial Genetics Div., Inst. of Genetic Resources, Faculty of Agriculture, Kyushu Univ., Higashi-ku, Fukuoka 812, Japan.

1497. Krizstan, Jan. 1995. Re: Work with seitan and soyfoods in Slovenia. Letter to William Shurtleff at Soyfoods Center, March 1. 2 p. Typed, with signature.

• **Summary:** Jan phoned on 6 January 1995, then wrote a long letter dated March 1. His first name is pronounced "Yan." He was born in 1967 in Ljubljana, the capital of Slovenia, where he now lives. He worked for two years on Slovenian television, then in 1992 he quit because of unhealthy working conditions. He had already been a vegetarian for 2 years and he knew that many people are looking for and need healthy food, but they don't know how to get it. So he started a small private company named "Izvor" ("The Source") and in Sept. 1992 started (together with friends) to publish a magazine in Slovenian titled *Bio Novice* ("Bio News") that would connect these people. The main subjects were growing plant foods in accordance with Nature, healthy diets, ecology, alternative medicine, and the culture of peace and non-violence. "It was very difficult, because we started with almost no money, but we published 15 issues of *Bio News*. In December 1994 we had to stop publishing because of big financial problems.

"One of my friends [Vesna Crnivec] translated some paragraphs from *The Book of Tofu* about preparing home made tofu and made an article. We published her translation,

a summary of the Introduction, and some of Akiko's illustrations in one of the first issues of *Bio News* (See issue 5/6, letnik 1993, p. 40-44). Some readers (especially women) showed great interest in it! Later I translated some paragraphs from *The Book of Tofu* and published them (together with Akiko's good illustrations) in issues 14 and 15 of *Bio News*. At the end of the article I gave the address of Soyfoods Center for all people interested in ordering your books.

"Last year I was attracted to making seitan and tofu from organic wheat and soybeans. Mr. Mirko Trampus is my very good friend. He has an organic farm in Metlika (1 km from the border with Croatia, in southeastern Slovenia). He has been growing wheat, soybeans, and daikon organically for the last 6 years with very good results. We decided to make a kitchen in his house for transforming Mr. Trampus' soybeans, wheat and daikon into tofu, tempeh, natto, soymilk, seitan and pickled daikon.

"A few days before New Year 1995 I visited all Ljubljana's bookshops, because I wanted to find some information about tofu and seitan. What a surprise! There was your *Book of Tofu*. I found it once again and bought a copy. I was so happy. Not far away I found the book *Cooking with Seitan* by Barbara and Leonard Jacobs, with a foreword by Aveline Kushi.

"Now (at the end of February 1995) we are making about 50 kg of seitan per week by hand. We sell it in some 20 healthy food shops all over Slovenia." He would like to start making tofu, soymilk, natto, and tempeh, Later he would like to make miso too. "Our aim is preparing 100% vegetarian foods of the highest possible quality, made from organically grown soybeans, wheat, and daikon. Now we need more information. Presently Mr. Trampus grows about 12,000 kg of wheat and 9,000 kg of soybeans per year. Prof. Spanring is our good friend. He helped Mr. Trampus to choose the best varieties of soybeans for making tofu and the wheat with the highest gluten content for seitan. Now we use hard winter wheat. We mill it into flour in our own mill with stones. From 100 kg of wheat flour we get about 23 kg of very dark brown seitan.

"Up until now, all of the starch has been rinsed by hand, but we have constructed an automatic rinsing machine which will be prepared for use very soon. We presently rinse using only warm water at about 30°C. We discard all the starch (putting it on compost heaps on the fields), but later we will use it as an ingredient in cooked soymilk puddings."

Jan would like to order *The Book of Tempeh*. He is looking for a source of tempeh starter. Tempeh is largely unknown in Slovenia, but he would like to introduce it because it is a healthy food and tastes very good. Address: Mestni trg 22/1, 68330 Metlika, Republic of Slovenia. Phone: (386) 068 59 481.

1498. Walsh, James. 1995. Suiting foreign tastes: Designer

foods being made to fit standards in Japan, world market. *Star Tribune (Minneapolis, Minnesota)*. March 5.

• **Summary:** There is a growing demand for "designer" beans—a "value-added" product. Minnesota researchers (such as those at the University of Minnesota College of Agriculture) have developed, and Minnesota farmers are growing and selling, soybean varieties especially tailored for Asian niche markets. Proto soybeans are large-seeded, and high in protein, excellent for making tofu. They are often grown under contract with Asian companies. Minatto soybeans are a small-seeded variety, sold to the Japanese for making natto. Chico soybeans, also small seeded, are used to make soy sprouts.

According to John McLaughlin, an international trade representative in the Minnesota World Trade Office, one promising and rapidly expanding new U.S. market is for organic foods. U.S. domestic sales of organic foods have risen dramatically from about \$178 million in 1980 to almost \$2,000 million in 1993, according the *Natural Food Merchandiser* magazine. The Japanese alone pay more than \$1,400 million a year for organic food, and that market has grown 80% a year for the past 5 years. Minnesota, which boasts 150,000 acres of organically certified cropland, is working hard to court these buyers.

Jim Orf, a professor and soybean researcher at the Univ. of Minnesota, notes that of the 20 to 30 soybean varieties developed by his university since the late 1970s, seven have been developed specifically for Japanese food use. In addition, private companies in Minnesota contract with Japanese buyers to develop and grow soybean varieties.

SunRich, a company in Hope, Minnesota, that grows soybeans and waxy corn for Japan, "also has developed edamame, the boiled green soybean that Japanese eat as bar snacks. But so far, U.S. versions of that food have not met Japanese taste standards." Allan Routh, a soybean farmer from New Richland, Minnesota, and part-owner of SunRich, grows 20-40% of his crop for export. He must work hard to meet the standards set by Japanese buyers, but the Japanese offer premiums of \$0.25 to \$1.50 per bushel.

1499. Azevedo, Chris; Gallagher, Paul. 1995. Trends in Japan's soybean market. Paper presented at a conference titled "Producing Soybeans for the Soyfoods Market." 8 p. Held 2 March 1995 at Ames, Iowa. [6 ref]

• **Summary:** The pages and most tables in this report are unnumbered. One table shows per capita annual consumption (in lbs) of soybeans in selected Pacific Rim countries in 1974, 1984, and 1994, as follows, in descending order of pounds consumed per capita in 1994: Indonesia: 9.2, 14.0, 23.2. South Korea: 21.4, 18.8, 20.1. Japan 11.0, 15.3, 16.7. North Korea: 11.8, 12.2, 11.2. Malaysia: 2.9, 5.2, 10.3. China: 14.7, 13.0, 9.7. Thailand: 1.2, 3.9, 3.9. Philippines: 0.4, 0.5, 0.8. Sources: (1) USDA; (2) U.S. Bureau of the Census, World Population Profile, 1994 and 1984; (3)

Statistical Yearbook, Statistical Office of the United Nations, New York, NY.

Another table shows annual soybean consumption in million metric tons in 1974, 1984, and 1994, as follows, in descending order of amount consumed in 1994: China: 5.237, 6.193, 5.350. Indonesia: 0.546, 1.072, 2.105. Japan: 0.716, 0.830, 0.950. South Korea: 0.328, 0.358, 0.410. North Korea: 0.083, 0.109, 0.117. Thailand: 0.023, 0.092, 0.105. Malaysia: 0.015, 0.036, 0.090. Philippines: 0.007, 0.013, 0.025. Source: USDA.

A final table shows the amount of soybeans used (in thousand metric tons) in Japan, by product and total, each year from 1978 to 1993, as follows: Use of soybeans for tofu rose from 486 in 1978 to a peak of 531 in 1984, falling to 492 in 1993. Use for natto rose from 71 in 1978 to a peak of 109 in 1993. Use for miso rose from 182 in 1978 to a peak of 185 in 1980, falling to 173 in 1993. The total rose from 750 in 1978 to a peak of 927 in 1992, falling to 920 in 1993. Address: Iowa State Univ. Phone: 515-294-0160.

1500. Furuhashi, Hideki. 1995. Japanese soyfoods markets. Paper presented at a conference titled "Producing Soybeans for the Soyfoods Market." 9 p. Held 2 March 1995 at Ames, Iowa.

• **Summary:** This paper consists of nine very interesting statistical tables, one on each page. Table 1 shows the supply and demand for soybeans in Japan from 1984 to 1992 (in tonne = metric tons). The supply of Japanese-grown soybeans decreased from 126,000 tonnes in 1984 to a low of 73,000 tonnes in 1992, and imports increased from 4,401,000 tonnes in 1984 to 4,725,000 tonnes in 1992. The demand for soybeans from crushers has stayed about steady, ranging from a low of 3,428,000 tonnes in 1991 to a high of 3,928,000 tonnes in 1985. Demand for food uses has increased from 786,000 tonnes in 1984 to a high of 927,000 tonnes in 1992 (up 18%). Demand for use as feed has increased from 55,000 tonnes in 1984 to 95,000 tonnes in 1992.

Table 2 shows soybean utilization in Japan by type of food product from 1987 to 1994: Use of soybeans for tofu and aburage stayed about steady at 498,000 tonnes, by far the largest food use. Use for miso decreased slightly from 180,000 tonnes in 1987 to 170,000 tonnes in 1994. Use for natto grew strongly from 97,000 tons in 1987 to 110,000 tonnes in 1994. Use for kori-tofu (dried-frozen tofu) grew slightly from 29,000 tonnes in 1987 to 30,000 tonnes in 1994. Use for soy sauce grew strongly from 5,350 tonnes in 1987 to a record 25,300 tonnes in 1992, dropping slightly to 23,000 tonnes in 1994. Use for soymilk decreased slightly from 4,000 tonnes in 1987 to 3,100 tonnes in 1994. Total use of soybeans for food in Japan grew slowly from 875,350 tonnes in 1987 to 930,000 tonnes in 1994 (up 6%).

Table 3 shows Japanese population and per capita consumption of soyfoods from 1982 to 1992. Population

grew from 103,720,000 to 124,452,000 during this period, while per capita consumption grew from 6.8 to 7.4 kg/capita (up 8.8%).

Table 4 shows per family expenditures and consumption per year on tofu, natto, miso, and soy sauce from 1982 to 1992. For example, expenditures on tofu increased from 2,535 yen in 1982 to 7,992 yen in 1992, while consumption fell from 87.98 cakes to 79.26 cakes. Thus in 1992 the average Japanese family consumed 1 cake of tofu every 4.6 days.

Table 6 shows imports of soybeans for food from the USA, Canada, and China from 1982 to 1992. Imports from the USA are subdivided into IOM, Beeson, and other identified varieties. In 1992 about 88.7% of food-grade soybeans imported to Japan from the USA were IOM. Moreover, of all these soybeans imported for food use in 1992, about 76.6% came from the USA, 21.5% from China, and 1.85% from Canada.

Table 6 shows the amount spent per capita by people of different 5-year age-groups on four soyfood products. The average person in the age 60-64 year group spent ¥2,976 on tofu, ¥1,539 on miso, ¥1,490 on soy sauce, and ¥1,098 on natto. The average person in the age 30-34 year group spent ¥1,581 on tofu, ¥603 on miso, ¥508 on soy sauce, and ¥708 on natto.

Table 7 shows the source of soybean used to make four soyfood products in 1984, 1990, and 1992. In 1992, of the 498,000 tonnes of soybeans used in tofu and aburage in Japan, 74.8% of the soybeans were IOM from the USA, 6.0% were Beeson (USA), 8.0% were other U.S. varieties, 3.0% were from China, and 8.0% were grown in Japan. Of the 30,000 tonnes use to make dried-frozen tofu, 86.7% were IOM and the rest were from China. Of the 108,000 tonnes used to make natto, 55.5% were from the USA and Canada, 39.8% were from China, and 4.6% were grown in Japan. Of the 176,000 tonnes of soybeans used to make miso, 88.0% were from China, 5.7% were white-hilum beans from the USA, and 6.25% were grown in Japan.

Table 8 shows that production of soybeans in Japan from 1982 to 1994 has decreased sharply. In 1982 some 262,300 tonnes were produced on 147,000 ha with a yield of 1,782 kg/ha. In 1994 some 98,800 tonnes were produced on 26,500 ha with a yield of 1,620 kg/ha.

Table 9 is two charts showing the distribution system for (1) Imported soybeans from suppliers to end users, and (2) Domestic soybeans from farmer to end users. Farmers sell to the Zenno Nokyo or a collector. Address: Mitsui & Co. Phone: 515-294-0160.

1501. Iowa State University. 1995. Producing soybeans for the soyfood market: Conference schedule and registration (Leaflet). Ames, Iowa. 6 panels.

• **Summary:** On Thursday, 2 March 1995, Iowa State University held a 1-day conference titled "Producing

Soybeans for the Soyfoods Market” at the Holiday Inn Gateway Center, Ames Iowa. No proceedings were published. Schedule: Wednesday evening: Tour of Iowa State University’s Pilot Plant and Center for Crops Utilization and Research. Soyfoods tasting reception follows at the Holiday Inn Gateway Center for conference registrants. Thursday. Morning session: Markets, trade, and policy. 8:30 a.m.–Welcome and introductions, by Lester A. Wilson. 9:00–Japanese soyfoods markets, by Hideki Furuhashi, Mitsui & Co. 9:45–Growth potential for soyfood beans in Asian markets, by Lester A. Wilson. 10:30–Break. 10:45–U.S. participation in soyfoods markets in the Pacific Rim, by Robert Neal, Agri-Grain Marketing. 11:30–Trade policy changes and opportunities, by Paul Gallagher. 12:15–Lunch. Afternoon session: Soybean varietal effects on soyfood quality. 1:30 p.m.–The effect of varietal characteristics on perceived soyfood quality, by Keisuke Kitamura, Chief, Legume Breeding Lab, MAFF [Ministry of Agriculture, Forestry and Fisheries], National Agricultural Research Center, 3-1 Kannondai, Tsukuba, Ibaraki 305, Japan. 2:15–Soybean breeder panel discussion, with Keisuke Kitamura, Walter Fehr (ISU), Dennis Strayer (Strayer Seeds), Tom Brumm (MBS Seeds), Clark Jennings (Pioneer Hi-Bred Intl.), Jerry Lorenzen (FTE Genetics). 2:45–ISU research presentations: (1) Soybean varietal and storage effects on tofu processing–Pilot plant study, by Lester A. Wilson and Patricia Murphy. (2) Rapid quality testing with near-infrared whole grain analyzers, by Charles Hurburgh. 3:30–Break. 3:45–Health benefits of soyfoods, by Mark Messina (American Soybean Association health consultant); Isoflavones in soybeans and soyfoods, by Patricia Murphy (ISU Dep. of Food Science and Human Nutrition). 5:00 p.m.–Closing comments and questions.

Conference sponsors: Midwest Agribusiness Trade Research and Information Center (MATRIC, Iowa State Univ.). Center for Crops Utilization Research (ISU). Utilization Center for Agricultural Products (UCAP, ISU). Iowa Soybean Promotion Board. MSGA/MSPRC (Minnesota Soybean Growers Assoc. / Minnesota Soybean Research & Promotion Council). Registration fee: \$100 before Feb. 15, or \$125 thereafter.

A five-page directory of the 74 attendees is attached. Address: Ames, Iowa.

1502. Northrup King. 1995. Corporate corner: Specialty soybeans offer farmers profitable alternatives without yield sacrifices. *ASA Today (St. Louis, Missouri)* 1(5):4. March. • **Summary:** At Northrup King edible soybeans combine specialty traits with top-notch yields. “Unlike many edible soybeans, Northrup King varieties are developed first for yield, then for specialty traits such as yellow hila, seed size, and high protein content.” John Thorne, director of breeding for Northrup King, says: “We recognize that even though these food-grade soybeans may capture a premium price, our

customers can’t afford to sacrifice yields.”

1503. Ontario Soybean Growers’ Marketing Board. 1995. Technical soybean mission: Japan, Hong Kong, Malaysia, Singapore. March 10-26, 1995. Chatham, Ontario, Canada. 23 p. 28 cm. [Eng]

• **Summary:** Contents: Participating members: Dr. Karen Lapsley, Mr. Ron McDougall, Mr. Michael Loh, Mr. Doug Jessop (food technologist and tofu expert, Harrow Research Station), Mr. Kim Cooper (marketing specialist, OSGMB). Note: This is the first Canadian soybean mission in which a food technologist (Doug Jessop) participated. Background. Mission objectives. Acknowledgements. Mission details–Japan: Canadian embassy.

Japan Miso-Co-op Industrial Association: Japan imports about 250,000 tonnes {metric tons} of soybeans from China each year, and about 150,000 tonnes of that amount is for the miso market. The remaining miso soybeans come from Canada, USA, and Japan. The best soybean for making miso comes from the Hokkaido area of Japan. It is a large, white hilum type, perhaps Toyomasuri. Generally the larger the soybean the better for making miso. Japanese miso makers need two types of soybeans from Canada: (1) Normal SQWH (Special Quality White Hilum); average values for color, taste and texture are acceptable though higher values would be preferable; (2) High Premium Soybeans; they would consider paying a premium for better color, taste, and texture.

Azuma Natto Foods Co. Ltd.: This natto company uses 7,000 tonnes/year of soybeans making them the third largest natto maker in Japan. They use 65% USA, 25% Japanese, and 15% Canadian soybeans. There are four sizes of natto: Small natto < 5.5 mm accounts for 72% of the natto market in Japan; Large natto, 5.5 to 6.2, account for 18%. Extra large natto > 8.5 mm account for 18%. Split seed natto account for 10%. Factors in assessing the suitability of soybeans for natto are: Fat content should be less than 19%. Total sugars–Group 1 contains sucrose, fructose, and glucose, group 2 contains raffinose and stachyose. Calcium affects the hardness or softness of natto. The ideal range is 180-250 mg/100 gm. Sanwa Company–Tofu manufacturer.

Wed., March 15–Japan Tofu Association: There are over 20,000 tofu makers in Japan, and 53 of these are members of this association, with half of the 53 being in the Tokyo area. Only 185 tofu manufacturers in Japan have 30 or more employees. Tofu makers consider there are two types of organic soybeans: true organic and semi-organic. The association imports about 2,000 tonnes of each type from the USA; they are OCIA certified.

Home Foods Company Ltd. uses 4,000 metric tons of soybeans a year, mostly a blend of 70% Chinese white hilum and 30% U.S. white hilum. The soys from the USA are I.O.M. soybeans, especially the “High Super” variety. For the more premium market they use a blend of 50%



Japanese soys and 50% Harovinton soybeans. They have also just started blending 50% Chinese and 50% Canadian white hilum soybeans. The two most important criteria for their soybeans are high protein and high total sugars. Sugar levels of Chinese soybeans (24-25%) are higher than those of Canadian soybeans (23-24%).

Thursday, March 16–Takeya Miso Co.: Ikuo Fujimori, President. Takeya has two plants employing 100 production workers and using 5,000 to 6,000 tonnes of soybeans yearly. 70-80% of their products are sold in supermarkets. For years they have been using the U.S. soybean variety Kanrich.

Nagano Chushin Agricultural Experiment Station: They have been breeding soybeans since 1957 and in that time have developed and released 17 varieties, the most famous being Enrei. The staff of 34 includes 5 soybean breeders. Dr. Nobuo Takahashi has been breeding soybeans for over 18 years. Japan has domestic soybean area of 370,500 acres (150,000 ha); it is decreasing, so imports are increasing.

Nagano Miso Industrial United Co-operatives: This group consists of 8 local co-ops made up of 160 miso manufacturers, who pay a fee to this group based on sales. There was a detailed discussion of the types of sugars in soybeans necessary for good miso.

Friday March 17–National Food Research Institute. Tsukuba is developing into a science research park, now containing over 200 different research institutes. NFRI, originally founded in 1934 as the Rice Institute, moved to Tsukuba from Tokyo in 1973. Thirty years ago, all tofu in Japan was made with Japanese soybeans. Dr. Toshiro Nagai spoke about natto: In 1992 the natto needs of Japan were met by soybeans from China (45%), USA (38%), Canada (17%), and Japanese domestic (8%). Natto consumption has increased by about 10% for each of the last few years. Dr. Sayuki Nikkuni spoke about miso: In 1992 the miso needs of Japan were met by soybeans from China (87%), USA (6%), Japan (6%), and Canada (1%). Dr. Kaoro Koyama spoke about tofu: In 1992 the soybeans for tofu totaled 490,000 tonnes and came from USA (390,000 tonnes; 80%), Canada (50,000; 10%), Japan (20,000; 4.1%), China (20,000; 4.1%), and South America (10,000; 2.0%).

Asahi Food Processing Co. Ltd. This plant, which has 350 employees and operates 365 days/year, was established in 1972 and produces tofu, fried tofu, natto, noodles, and juices. They use 15 tonnes of soybeans daily or 4,900 tonnes/year, of which 38.8% are grown in Japan and the remaining 61.2% are IOM from the USA. Each day they make 120,000 cakes of tofu, 100,000 pieces of fried tofu, and 20,000 packages of natto. Most of the soybeans they use in production are dehulled. They use about 500 tonnes/year of OCIA certified soybeans from the USA and some semi-organic soybeans from Japan. The prices they pay per kg of soybeans are: IOM 30-40 yen; Vinton, identity preserved varieties, and Harovinton [Harovinton] 100 yen; organic 120-140 yen; Enrei (Japanese) 400 yen.

Saturday, March 18–Hong Kong. Canadian High Commission. Canada Packers (Hong Kong) Ltd.

Monday, March 20. Shenzhen Economic Zone: This area of 30 square km, just outside the Hong Kong border, contains 1 million people or 60% of the provincial population, all of whom require a special permit to work in the area. This economic zone is booming, basically due to spiralling costs in Hong Kong, where many businesses and factories are closing and moving to this area, where land and labor costs are much lower.

Shenzhen Vitasoy (Guang Dong) Foods & Beverage Co. This plant, which is only one year old, produces a major share of the soymilk for Hong Kong. They are able to import soybeans at a low tariff rate because they ship the majority of their finished products back into Hong Kong. The plant uses Canadian SQWH (Special Quality White Hilum) soybeans, but has problems with uneven seed size. They presently receive the soybeans in 45 kg jute bags, but would prefer strong 45 kg poly-lined paper bags. A small percentage of dairy milk is mixed with the soymilk, which is thought to improve its texture and taste.

Tuesday, March 21. Dah Chong Hong, Ltd. This was the first company to import Canadian soybeans for food use in the early 1970s. Dah Chong pointed out that Ontario soybeans were experiencing increasing competition from Quebec soybeans, especially in the past two years. The Quebec soybeans are 5-10% less expensive, due to lower basis levels, lower freight costs, and being more aggressive in a new market. Their quality is similar to Ontario, though the seed coat color is somewhat darker. There are about 50 tofu makers in Hong Kong, 10 larger size and 40 smaller size, although there is not a large difference in size. Consumers believe that packaged tofu is not as fresh as that purchased fresh daily from local markets.

Amoy Food Ltd. (Dr. Alain Butler; This plant makes soy sauce and other sauces used in cooking. They use only Canadian soybeans, the Maple Glen variety from Quebec). Wed., March 22. The group visited Hung Tao Soya Bean Products Pty., a traditional Hong Kong tofu and soybean sprout plant in the New Territories.

Thursday, March 23–Malaysia. Canadian High Commission. Yeo Hiap Seng (Malaysia) Berhad (Contains excellent details on the company). Chop Lee Kit Heng Sdn. Bhd. (A soybean trader selling to end users in Malaysia).

Friday, March 24–Singapore. Canadian High Commission. Yeo Hiap Seng Ltd. (Singapore). Meeting with nine tofu manufacturers in Singapore. (The name of each company is given. There are 40 tofu makers in Singapore, and the majority now use Canadian soybeans. Tofu growth in the last 5 years has been very rapid and competition is fierce). Asia Corporation Pte. Ltd. (This company accounts for about 70% of the soybeans imported into Singapore and Malaysia. They first brought Canadian soybeans into the area in 1978). Canadec Private Ltd. Sing Yeap Trading Pte. Ltd.

Saturday, March 25—Unicur Food Company Pte. Ltd. (Mr. Goh gave a tour of his facility and discussed his plans for a new plant in late 1995). Yam Thye & Co. (Warehouse).

Encore Ltd.: Sylvia B. Hollenstein, managing director. This company, based in Switzerland, uses Swiss technology to produce soy yogurts, chocolates, and noodles in Switzerland from Chinese soybeans—mostly for the taste. The products are shipped from Switzerland to the company's 3 retail stores in East Asia; they plan to expand to 10 retail stores by the end of 1995.

Appendixes A through J, issued as a separate document, contain extensive and detailed information and some published documents related to the technical mission. Address: P.O. Box 1199, Chatham, ONT N7M 5L8, Canada. Phone: 519-352-7730.

1504. Kawakami, Kozo. 1995. *Tsurezure Nihon shokumotsushi: Dai 3 kan* [Leisurely history of Japanese foods. Vol. 3]. Tokyo: Tokyo Bijutsu. 195 + 3 p. Illust. Index. 21 cm. [Jap] • **Summary:** As the title implies, the author is writing about 50 foods he finds particularly interesting.

Entries containing an asterisk (\*) are about or mention soy. About Mr. Kawakami (sensei) by TANAKA Seiichi. *Dengaku tofu* \* (p. 1+). History of *dengaku tofu* \* (p. 3+). *Yuba* \* (p. 8+). Summary of “History of Tofu” \* (p. 13+). *Abura-age* of tofu (Deep-fried tofu pouches) \* (p. 17+). *Itohiki natto* \* (p. 21+). *Tororo* (Grated tororo imo—glutinous yam—is often served atop dishes such as *soba* = buckwheat noodles) (p. 24+).

*Oroshi daikon* (Finely grated juicy raw daikon = Giant Japanese white radish) (p. 30+). *Oroshi-gane* (Grater) (p. 33+). *Mentori daikon* (One method of cutting the daikon root to keep the shape during the simmering) (p. 37+). *Owari daikon* and *miyashige daikon* (Names of daikon varieties) (p. 39+). *Gobo* (Burdock root) (p. 43+). *Sasagaki gobo* (burdock root) and *sasagaki daikon* (*Sasagaki* is a special shaving/cutting method. End result: the cut vegetables look like bamboo leaves) (p. 48+). *Yatara-zuke* (A kind of pickles) \* (p. 52+). *Kaku-ae* (p. 55+). *Asa-zuke* (pickled asa) (p. 57+). *Takuan-zuke* (Pickled radish) (p. 62+). *Osaka-zuke* (p. 67+).

*Fu, ki-bu, and shofu / sho-fu* (Types of baked wheat gluten) (p. 70+). History of the development of *fu* (Part 1) (p. 76+). History of the development of *fu* (Part 2). *Kanso-fu* (dried) and *Kaki-fu* (Broiled) (p. 81+). *Awase-fu* and *Yose-fu* \* (p. 86+; *tofu* is mentioned). *Chirimen-fu* (p. 88+). *Tosa-fu* (p. 91+). *Shian-fu* \* (p. 94+; *tofu* is mentioned). *Yamakawa-fu* and *Chiyo-fu* (p. 97+).

*Azuki* beans and *Aka* (red) *azuki* beans (p. 101+). *Dainagon azuki* (a special variety of *azuki* beans) (p. 106+). *Azuki no suri-jiru* (Soup of pureed *azuki*) (p. 109+).

*Hishio*—the other name is *shoyu no mi* (Moromi mash & *shoyu* presscake) \* (p. 115+). *Suri-Hishio* (ground *hishio*) \* (p. 121+). *Ume-bisho* and *Yubi-hishio* \* (p. 125+). *Hishio* and *shishi-bishio* \* (p. 130+) *Azuki Kai* (*Azuki* porridge),

*Aka-kai* (Porridge), *Uncho-juku* (Porridge) (p. 133+) *Unzo-kai* (Porridge) and *Unzo* (p. 138+). *Kowaii* and *Seki-han* (Rice recipes; *Sekihan* is red *azuki* rice) (p. 141+). History of *shiso* (*Shiso* leaves are translated as “Beefsteak leaves”) (p. 148+).

*Asazuki* (p. 150+). History of *Karashi* and *Keshi* (p. 153+). What is *Araragi*? (p. 158+). *Tade / Tade* (p. 163+). *Itachi hajikami* and *Inu sansho* (p. 167+). History of *sansho* (*Sansho* seeds are one type of spice) (p. 170+) *Hajikami* and *Shoga* (Ginger) (p. 174+). History of *myoga* (A Japanese leafy plant with a strong flavor that is often used for a topping for *Hiyayakko Tofu*) (p. 178+). *Myoga-take* (p. 181+).

*Sai*??? *Seki* (Chinese Name) and *Niragi* \* (p. 184+). *Kawakami sensei* and the *Rikagaku Kenkyujo* (Note: *Rikagaku* means physics and chemistry), by MATSUSHITA Sachiko, Honorary Professor of Chiba University (p. 190+). *96 Years of my father's life* by Kozo Kawakami's eldest son (Tadashi? / Tsutomu?) (p. 192+). *My father, Kozo Kawakami,—A view from his 2nd son* (p. 194+).

A photo (p. 191) shows the members of the *Rikagaku Kenkyujo* seated together on *tatami* mats in a room. A separate outline sketch and legend shows the name of each member.

The section titled “*Kawakami sensei* and the *Rikagaku Kenkyujo*,” by Prof. Matshita states (p. 190): I was able to receive his guidance for 20 years ever since I became a member of the *Ryôrisho Genten Kenkyu Kai*, a study group that started in 1994. They met at Keio University's old wooden classroom. These people studied old culinary documents together. I listened to his lecture on the *Ryôri Monogatari*. I could not do my present work that involves Edo period culinary literature without his influence.

I also saw him at the members meeting, visited his home, listened to his talks, and took a look at his sketchbooks on many occasions. On those occasions, he enjoyed talking about his experience at *Riken* (*Rikagaku Kenkyusho*) before the war and his teacher Dr. SUZUKI Umetaro. His work on the history of Japanese Food History got started after he retired. His work before his retirement was on agricultural chemistry (*nogei-kagaku*). He worked mostly on Vitamin A at Dr. Umetaro SUZUKI's Lab. in *Rikagaku Kenkyusho* until he moved to *Manshu Kokuritsu Tairiku Gakuin* in 1937. He received his PhD in Agriculture.

I first met him at a funeral of the late TSUJI Michiyo sensei in June 1989 held at Enmeiji Temple in Urawa. The late TSUJIMURA Michiyo sensei was in the same lab as Kawakami sensei.

The photo on the next page shows the golden age of *Riken* group who worked under Dr. Suzuki. I made a copy of one of the 3 photos from late TSUJIMURA Michiyo Sensei's album. He didn't have any photos from our days in Manchuria, so I was very happy and drew the picture below. The man in the center in the dark suit is Kawakami sensei.

Letter (e-mail) from Naomichi Ishige, Japanese food historian. 2008. May 18. KAWAKAMI Kozo, who passed away in 1994, was the foremost philologist on Japanese food culture. Thus, his writing is reliable enough. Continued: Address: Japan.

1505. Kawakami, Kozo. 1995. *Tsurezure Nihon shokumotsushi: Dai 3 kan* [Leisurely history of Japanese foods. Vol. 3]. Tokyo: Tokyo Bijutsu. 195 + 3 p. Illust. Index. 21 cm. [Jap] • **Summary:** The chapter titled natto (*itohiki nattô*; p. 21-23) states: Within the natto family, there are dry types, *shiokara natto* (salty natto) and *itohiki natto* (regular / sticky natto) which can make sticky threads when it is moist, stirred with a pair of chopsticks, and picked up (as with chopsticks). It is thought that *shiokara natto* appeared in the Heian period because its name appears in the book titled *Shinsarugakuki* in around 1062 as *tsuki shiokara natto* (pounded salty natto) and *shiokara natto* (salty Natto). But for *itohiki natto*, no clear (definite) document was found, so people thought it appeared in late Edo period. But I don't think in that way. There might be a blank period in the literature, but you cannot say no document was found. There are some documents that mention *itohiki natto*. I am going to mention them here.

The first is *Shojin Gyorui Monogatari* (1320-1380). It is a story (fictional) of a battle between *shojin ryori* (Buddhist vegetarian cookery) and *gyocho ryori* (fish and poultry cooking). It is told that the book's author is called *Nijo Kanpaku* (the word *kanpaku* means a high ranking government officer who assisted the Japanese Emperor politically, or is a nick name for a person who is very powerful) whose real name was Nijo Yoshimoto and was well known for his talent in literature.

This story was written around 1320-1380, near the end of the Kamakura Bakufu and during Nanboku-cho period. (The books called *Teikun Orai* {1350} and *Isei Teikun Orai* {1370} were written during the same period.) This story is one of the documents that mentions *itohiki natto*.

The next document is *Noritoki-kyo-ki* (the diary of Noritoki) written in Ouei 12 nen (in 1405). I was told that there was an entry of December 19; "Rokkaku gifted *itohiki natto*." So I thought that since I had read this whole book before, I decided to check my notes about this book and then I found out that I, too, noted *itohiki natto* (mentioned) in Ouei 12 nen, Dec 19. Although I didn't write "Received *Itohiki Daizu* from Rokkaku (person's name)", it was maybe *Itohiki Natto* which was given by Mr. Rokkaku. I confirmed this by checking with Mr. Takeshi TOYOTA's *Chusei Shogyo-shi* (History of Middle Age Commerce) and also my old notes.

After that, there are no documents mentioning natto until the *Tamon-in Nikki* (Diary of Tamon-in) in an entry dated Eiroku 11, May 21 (May 21, 1568). In this diary he wrote "Tried drying natto but then it got wet from the the

humidity of rainy air. So mix salt into *netaru natto* ('slept natto') by roasting salt well and while the salt is very hot, mix it into natto and dry the salted natto again. It won't get moist from the rainy season. *Meizen-bo* (A Zen monk?) said so." *Netaru natto* ("slept natto") means fermented natto and is *itohiki natto*. But the document just before this was written in 1405, so there is a gap of over 100 years between those two documents; that is the shortcoming of the literature (that mentions *itohiki natto*). Then the next document is from late in the early Edo period. "Kefukigusa (Kefukiso?)" in 1645. "Kefukigusa" is a textbook for Haikai (Haiku and Renka). In this book published by Iwanami Buko, Ooyu (?), saliva of a cow, 3 wheels, strings for the puppet. etc. and also natto were listed among the (supportive) words (to make Haiku and Renka). Therefore there must have been natto at that time. To summarize: I checked and confirmed the *Noritoki-kyo-ki*, and also if there are other documents that can be found on related subjects. The documents on *itohiki natto* can be traced from the present all the way back to the period of *Natto Taro Itoshige*. But I really think that probably it continuously goes up to the period of *Natto Taro Itoshige*. Note: This is his guess after checking the documents.

Bibliography:

(1) *Shojin Gyorui Monogatari*: published by the Konnyaku Association in the book called "Konnyaku Kyokai Shi" (History of Konnyaku Association). This book contains the whole story of the *Shojin Gyorui Monogatari*.

(2) *Tamon-in Nikki*: "Netaru Natto" (was mentioned) in it. Eiroku 11 (1568) May 21

(3) *Kebukiso (Kebukigusa?)* 1645. *Tsukeku for itohiki* (adding word for the word *Itohiki*). Re-published as Iwanami Bunko Bon and it was mentioned in Iwanami Bunko Bon page 109. (Note: He forgot to mention this book's year of publication.)

(4) *Edo Ryori Chu*. 1673. "Nese Natto" *Nihon Ryori Taikan*, Dai 2 Kan 118-1. (Volume 2, 118-1)

This chapter was written in Heisei 5 nen (1993) Dec. 2.

An illustration (p. 23) includes some writing: On the top container: *Kinzanji Miso* (Miso?) is written. Note: The Chinese characters are *Mi* as in Miso and the character for *hishio*.

On the bottom container is written "natto."

This illustration came from *Wakan Sansai Zue*. Address: Japan.

1506. *Ontario Soybean Growers' Marketing Board Newsletter*. 1995. Producing soybeans for the soyfood market. April. p. 3.

• **Summary:** In early March, 1995, Iowa State University conducted a seminar titled "Producing Soybeans for the Soyfoods Market." Topics covered included an introduction to soyfoods (complete with tasting at Iowa State's Center for Crops Utilization Research facility), a review of Japan's soyfoods market, trade policy changes and challenges,

quality assessment, and the effects of varietal characteristics on soyfood quality.

Speaking on Japan's soyfoods market, Hideki Furuhashi of Mitsui & Co. reported that consumption of tofu and natto is increasing slowly in Japan, while miso and soy sauce are decreasing. China has been supplying Japan with 250,000 to 300,000 tonnes/year of soybeans, mainly for making miso and natto. Japan imports between 120,000 and 130,000 tonnes/year of identity preserved soybeans, up from 100,000 tonnes 5 years ago. For example, 50,000 tonnes of Vinton were imported in 1994.

Bradley Hildebrand of Cargill in Minneapolis, Minnesota, reported that the U.S. exports about 130 million bushels/year of soybeans to Japan. About 30 million bushels (23% of the total) are used to make soyfoods. Most of the soybeans used for soyfoods in Japan are "IOM" beans because they are grown in Indiana, Ohio, and Michigan. IOM soybeans are not any specific variety or hilum color, but they are generally higher in protein and better in quality than other U.S. soybeans. They trade at a premium of 10-20 cents per bushel over other U.S. soybeans in Japan. IOM soybeans are traded on the Japanese grain exchange. For shipment to Japan, IOM soybeans are railed to Baltimore (Maryland) or Norfolk (Virginia) for shipment via panamax size vessels. They may also be railed to Mobile (Alabama) or New Orleans (Louisiana) for vessel shipment.

Hildebrand reported that IOM soybeans will keep the largest market share due to their low price, however there is a market for variety soybeans. He said that Vinton is the most popular variety for making tofu in Japan, but it does not yield high enough in the field to make it price competitive. "He suggested that breeders need to develop a high-yielding soybean with Vinton's tofu-making characteristics. However he said the market for variety soybeans is not huge and is easily flooded." Address: Box 1199, Chatham, ONT, Canada N7M 5L8.

1507. Akintayo, Issaya. 1995. Re: Introduction of soybeans to Chad. Letter to William Shurtleff at Soyfoods Center, May 22. 3 p. Typed, with signature.

• **Summary:** "Joyce Lombardi sent me your correspondence on the subject of the cultivation and utilization of soya in Chad [Tchad]. The soybean was introduced to Chad in about the year 1975. It was cultivated on an experimental basis at the CFPA (*Centre de Formation Professionnelle Agricole*). Unfortunately its popularization did not last long, because those who introduced the soybean did not show the population the different possible uses of this miracle plant. The only way of using soybeans that the population knows is as dawa dawa, called "Ndi" here in Chad.

"After my arrival in Chad in 1992 the soybean was given a second chance to succeed. In effect, having noted the very high level of malnutrition in the country, and above all among the infants and children, I conducted a program

of educating the population by showing them how they could make a line of products from soya such as milk, yogurt, cheese, cakes, biscuits, bread, pizza, patés, *sojatine* (soya coffee, for which I coined the name, and which name everyone now uses), and weaning foods based on soy flour.

"For example, roasted soybeans + maize/corn flour + sweet potato flour gives a mixture of flours, which I called 'Maipaso.' I introduced it to people via several expositions of soy-based menus, through demonstration shops that processed soya, and gifts of soya to hospitals to aid malnourished infants and children.

"In terms of agronomy, I have introduced several soybean varieties from Nigeria (IITA), Senegal, Togo, etc. These introductions were made to identify early maturing varieties that could be used to extend soybean cultivation into several ecological zones within Chad. These varietal studies are still in progress.

"In terms of education, during 1994 I educated more than 400 people. The demands for education are great but unfortunately we do not have the budget to realize them. Presently the population has taken an interest in the utilization of soya. Certain groups are taking charge of educational materials and are asking for my help to teach them how to make the different menus. Periodically I give interviews which are broadcast widely via rural radio and the written press. Copies of some articles are enclosed. At the end of last year I wrote and had published a 40-page color document titled 'Soya, how to cultivate and use it' which also contained recipes.

"After this summary, I will try to answer your questions:

1. There was no written documentation on soybean cultivation and use in Chad before the publication of my book at the end of last year.
2. Soybean was introduced to Chad during the late 1970s.
3. The origin of the soybean presently cultivated in Chad is not documented. It may come from Nigeria. The variety name is not known either.
4. The average yield is about 800 kg/ha.
5. The total area cultivated is not known because nobody was working with this crop until my arrival in this country. It is only now that its cultivation is gaining momentum. Now everybody wants to cultivate soybean. It became the crop of the year."

Accompanying this letter are four excellent color photos which show: (1) A Chadian woman pounding soybeans using a wooden mortar and pestle. She is surrounded by other women, all dressed in traditional colorful clothing, and taking part in an educational workshop. The pounded soybeans will be used to make soymilk and other soy products. (2) A Tchadian man holding a bag containing long loaves of soy-fortified bread (baguettes). "This product is greatly appreciated by the local population."

(3) A Tchadian mother hand-weeding a field of soybean plants. Her baby is sleeping on her back; both are dressed in traditional clothing. (4) A Tchadian woman seated the porch of her home in Sarh pressing the soymilk out of a bag

of pounded soybeans mixed with water. In front of her are a wooden mortar and pestle.

Note: This document contains the earliest date seen for soybeans in Chad, or the cultivation of soybeans in Chad (about 1975). The source of these soybeans is unknown. Address: PhD, UNDP Project Advisor, Box 9, Sarh, Chad. Phone: +235 68-12-43 Fax: (235) 68-1309.

1508. Liu, Keshun; Orthoefer, Frank; Thompson, Keith. 1995. The case for food-grade soybean varieties. *INFORM (AOCS)* 6(5):593-96, 598-99. May. [10 ref]

• **Summary:** Contents: Introduction. Food beans vs. oil beans. Traditional soyfoods: Soymilk, tofu, toasted full-fat soy flour [kinako], soy sprouts, soy sauce, miso, tempeh, natto. Soy protein ingredients: Soy grits and flour, soy protein concentrates, soy protein isolates. Soyfood nutrition. Current size of food bean market. Breeding of food beans. Conclusions.

“Oil/meal beans include all the commonly produced soybeans.” The oil is typically used for food and the meal for livestock feed. However the “new varieties of food soybeans” are generally exported to countries in East Asia for preparation of Oriental soyfoods. Table 3 compares the attributes of food beans vs. oil beans. Seed size: Large vs. small to large. Seed uniformity: High vs. no preference. Hull color: White-yellow vs. yellow. Hull quality: Thin, firm vs. no preference. Hilum color: Clear to buff vs. clear to blank. Protein content: High vs. medium to high. Oil content: Low to high vs. high. Cleanliness: U.S. Grade 1 or better vs. any grade. Major applications: Tofu, soymilk vs. oil, defatted meal.

In addition to their use in making traditional soyfoods, the “new food-grade varieties,” especially those with high protein content, have been marketed for preparation of toasted full-fat soy flour, defatted soy flour, and soy protein concentrates and isolates.

Photos show: (1) Keshun Liu, Frank Orthoefer, and Keith Thompson. (2) Color and size comparison of soybeans for food use and those intended for crushing (color). The “food beans” are larger than the “oil beans.”

Note: This is the earliest English-language document seen (July 2001) that contains the term “oil beans” or the term “oil/meal beans,” both used in contrast to “food beans” or “food soybeans.” This is also the earliest English-language document seen (July 2001) with the term “food-grade” (or “food grade”) used in the title to refer to soybeans or soybean varieties. Address: 1. Project Leader, Soyfood Lab., Jacob Hartz Seed Co. Inc., 901 N. Park Ave., Stuttgart, Arkansas 72160; 2. Vice President for research and development, Riceland Foods Inc., P.O. Box 927, Stuttgart, AR 72160; 3. Vice president, International Soyfood Sales, Jacob Hartz Seed Co.

1509. Reuters. 1995. Rotting beans make sweeter feet.

*Toronto Star (Ontario, Canada)*. June 20. p. A16.

• **Summary:** A Japanese biotechnology firm named Capital Corp. (president Tsutomu Harada) has launched a product (Niowan 201) using natto bacteria to remedy acute foot odor. Natto, sticky fermented soybeans, are widely eaten with rice for breakfast in the northern half of Japan.

The company, based in Osaka, “combines dormant natto bacteria with sawdust and rice bran into thin packs worn under the feet. The other ingredients preserve the bacteria until they are activated by the heat and humidity of the feet, neutralizing the bad smell.”

1510. Iwata, Masakazu. 1995. Re: The pioneering work of Gonshiro Harada (died 1943) with koji, tofu, miso, natto, and okara in California. Letter to William Shurtleff at Soyfoods Center, Aug. 25. 1 p. Typed, with signature.

• **Summary:** Mr. Iwata is the author of *Planted in Good Soil: A History of the Issei in United States Agriculture* (1992). Yesterday he contacted Fred Harada, “whose father had a tofu manufacturing establishment in the Fresno area... He is a good source of information. His father, Gonshiro Harada (died 1943), an Issei (first-generation Japanese immigrant to the USA) from Hiroshima Prefecture, was a master koji-maker who learned his trade in Japan. He opened a store in Fresno in the 1920s but went broke during the depression of 1929; he was a creditor unable to collect from credit customers. Subsequently, in 1939, he relocated in Fowler, about 10 miles southeast of Fresno, where he and his wife and family (nine children) established the Harada Tofu Co. and manufactured such foods as tofu, kamaboko, agé, miso, natto, okara, and other related items, peddling them to the Japanese farmers in a broad area of Central California. Of course the company handled vegetables and other grocery goods on their route consisting of several hundred customers.

“Fred indicates that his father was an innovative entrepreneur who made much of his own tofu-making equipment.” Fred believes his father got at least some of his soybeans from rice growers in the Colusa region, who grew soybeans as a sideline. “He mentioned that the Koda rice farms in South Los Baños may have had some acreage in this crop.”

Fred Harada can be contacted at 637 North 6th Street, Montebello, CA 90640. Phone: 213-721-8455. Best to contact him after 7:00 p.m. Address: 879 North Vail Ave., Montebello, California 90640. Phone: 213-723-4389.

1511. Iwata, Masakazu. 1995. Re: Early soybean cultivation by Japanese rice growers in central California around the time of World War I. Letter to William Shurtleff at Soyfoods Center, Aug. 25. 1 p. Typed, with signature.

• **Summary:** Yesterday Dr. Iwata contacted Fred Harada, “whose father had a tofu manufacturing establishment in the Fresno area... He is a good source of information... My conjecture would have been that much of the soybeans for

the tofu came from abroad, but according to Fred, some of the Japanese rice growers, whose heyday in rice farming was around the time of World War I [1914-1918] in the Colusa region, grew soybeans as a sideline. He mentioned that the Koda rice farms in South Los Baños may have had some acreage in this crop.

"I have a section in my book (*Planted in Good Soil: A History of the Issei in United States Agriculture*. New York: Peter Lang Publishing, 1992) on the Koda farms, utilizing information from interviews and the Keisaburo Koda biography in Japanese (*Koda Keisaburo Den*, 1965), but found no mention of soybean production. You might contact Edward Koda (P.O. Box 6, South Dos Palos, California 93665), the son of the founder, about this. I believe the operation is now in the hands of Ross, the third generation heir.

Fred Harada can be contacted at 637 North 6th Street, Montebello, CA 90640. Phone: 213-721-8455. Best to contact him after 7:00 p.m.

Update: Letter from Dr. Iwata. 1996. Dec. 6. "Most likely the Chinese who arrived in California around the time of the Gold Rush of 1849 introduced soybeans from China." Address: PhD, 879 North Vail Ave., Montebello, California 90640. Phone: 213-723-4389.

1512. Muramatsu, Kanako; Kanai, Yukiko; Kimura, Noriko; Miura, N.; Yoshida, K.; Kiuchi, Kan. 1995. [Production of natto with high elastase activity]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 42(8):575-82. [20 ref. Jap; eng] Address: Kyoritsu Women's Univ., 2-2-1 Hitotsubashi, Chiyoda-ku, Tokyo 101, Japan.

1513. Orthoefer, Frank T.; Liu, Keshun. 1995. Soybeans for food uses. *International Food Marketing & Technology (Germany)* 9(4):4-8. Aug. [5 ref]

• **Summary:** Contents: Introduction. Traditional soy foods: Soy milk, tofu, toasted whole soybeans and full-fat soy flour, soybean sprouts, yuba, soy sauce, tempeh, natto, miso. Soy protein ingredients: Soy grits and flour, soy protein concentrates, soy protein isolates. Soy nutrition: Soy protein, fat and calories, phytochemicals. Food bean market. Summary.

Two "different types of soybeans have emerged: oil beans and food beans. This is particularly true in the US soy market..."

Of the fourteen phytochemicals, seven are present in soybeans. These seven are phytates, isoflavones, carotenoids, coumarins, triterpenes, lignans, and phenolic acids. Phytochemicals have been shown to affect human health as much as vitamins and minerals, and many of them have anti-cancer properties. The discovery of phytochemicals may change how the nutritional value of food is assessed.

The world market for soybeans for food use is estimated

at about 1 million metric tons (tonnes). In Japan alone about 830,000 tonnes are made into soyfoods as shown in a pie chart as follows: Tofu (552,000 tonnes, 63.4%), miso (180,000 tonnes, 21.5%), natto (90,000 tonnes, 10.7%), soymilk (10,000 tonnes, 1.2%), soy sauce (5,000 tonnes, 0.6%), and others (22,000 tonnes, 2.6%). In the USA the food bean market is estimated at 50,000 tonnes. Other major markets for food beans are in Korea, China, Taiwan, Hong Kong, Singapore, Malaysia, and Thailand. Food-grade soybeans can be sold by the growers at a premium of 5-20% above the base price. The demand for food beans is increasing steadily. Address: 1. Vice President, R&D, Riceland Foods, Stuttgart, Arkansas; 2. Project Leader, Soy Food Lab., Jacob Hartz Seed Co., Stuttgart, Arkansas.

1514. Stevens, Jane Ade; Stevens, Roger. ed. and comp. 1995. U.S. soyfoods directory. Lebanon, Indiana: Indiana Soybean Development Council. 31 p. 28 cm.

• **Summary:** This first edition of the directory contains more than 270 company listings. The cover is checkerboard red and white. Contents: Forward [sic, Foreword]. How to use the Soyfoods Directory (incl. Internet access). Soyfood descriptions (alphabetical): Edamame (Sweet beans), food use soybeans (whole soybeans), organically grown soybeans, isolated soy proteins, lecithins, meat analogs (meat alternatives), miso, natto, nondairy (soy) frozen desserts, okara, soy cheese & yogurt, soy flour & grits, soy grits, soy meal & flakes, soy nuts, soy oil, soy protein concentrates, soy sauces (tamari, shoyu, teriyaki), soymilk, tempeh, textured soy proteins, tofu & products. Composition and nutrient content of soyfoods (large table, p. 7). Soybean products chart: From whole soybeans, from soybean meal, from soy oil and lecithin. Soyfood companies by product (products listed alphabetically).

Soyfood companies (alphabetical by company name; Each listing contains address, contact, phone, soy products, product names, distribution, to locate product, classification). Soyfood companies by state (alphabetical by state; California has by far the most). Professional associations and industry information resources. U.S. soybean facts. Soyfoods directory survey.

This directory's address on Internet's World Wide Web is <http://www.in.net/soy>. For more information or suggestions, call 1-800-275-7679. Address: Stevens & Associates, 4816 North Pennsylvania Street, Indianapolis, Indiana 46205. Phone: 1-800-275-7679.

1515. Tamang, Jyoti P. 1995. Role of microorganisms in traditional food fermentation technology in the Himalayan regions. In: Proceeding Abstract of the Tenth International Conference on Global Impacts of Applied Microbiology, Elsinor, Denmark. See p. 61. Held 6-12 Aug. 1995. \*

• **Summary:** Includes a discussion of kinema, a fermented food made from soybeans. Address: Dep. of Botany, Univ.

of North Bengal, NBU 734430, District of Darjeeling, West Bengal, India.

1516. Fallon, Sally W.; Enig, Mary G. 1995. Soy products for dairy products? Not so fast. *Health Freedom Newsletter (Monrovia, California)* 14(5):12-20. Sept. [35 ref]

• **Summary:** Contents: Introduction. History of the bean. Fit for human consumption? Marketing the soybean? Processing denatures and dangers remain. Soy formula not the answer. Fabricated soy foods. Cancer preventing or cancer causing? Soy products are not complete. Only fermented soy products are safe. Another look at milk. Processing is the problem [that transforms healthy milk products into unhealthy ones]. Quality dairy products are available. Butter is a healthy food. Homemade formula best for babies. Contains two recipes for homemade formula: Milk based formula (based on unhomogenized raw organic milk plus lactose, cod liver oil, coconut oil, etc.). Milk free formula (based on 3½ cups of homemade broth, made from beef, lamb, chicken, or fish).

This article is written to scare people “who have turned to soy products as substitutes for dairy products,” and to sing the praises of natural (fresh, raw, and organic) dairy products. It is loaded with so much incorrect information and false conclusions about soybeans and their alleged dangers to human health that one does not know where to begin in starting to refute them. To take just a few such statements: (1) “The Chinese did not eat the soybean as they did other pulses (legumes) such as the lentil, because the soybean contains large quantities of a number of harmful substances.” Fact: The soybean, processed into a host of soyfoods using simple technologies, has been the main legume consumed in China since ancient times. It has long been referred to as “The cow of China.”

(2) Trypsin inhibitors in soybeans are “not completely deactivated during ordinary cooking and can produce serious gastric distress, reduced protein digestion and chronic deficiencies in amino acid uptake.” Facts: The SoyaScan database contains 386 articles on trypsin inhibitors. When active, these proteins inhibit trypsin, a digestive proteolytic enzyme secreted by the pancreas, which helps us to digest proteins. Fortunately, trypsin inhibitors are almost completely deactivated by the typical cooking of soybeans to make soyfoods. There is no scientific evidence that the small percentage remaining has any adverse effects on human health, digestibility, or amino acid absorption. A considerable body of research, starting in the 1970s, shows that trypsin inhibitors have anti-cancer properties.

(3) “The soybean also contains hemagglutinin [sic, hemagglutinins], a clot promoting substance that causes red blood cells to clump together.” Fact: Like trypsin inhibitors, hemagglutinins are inactivated by ordinary cooking and have been a non-issue in the scientific literature for at least 10 years.

(4) Soybeans are high in phytic acids or phytates,

which can cause health problems. “Only a long period of fermentation will significantly reduce the phytate content of soybeans.” “Oriental children who do not get enough meat and fish to counteract the effects of a high phytate diet, frequently suffer rickets, stunting and other growth... Parents would do well to ask their six-year old boys whether they would prefer to be six-foot-one or five-foot-seven when they grow up, before substituting tofu for eggs, meat, and dairy products.” Fact: Phytates and phytic acid are a two-edged sword. They appear to inhibit mineral absorption by forming tight chelates with a variety of polyvalent metals such as calcium, zinc, and iron. By virtue of forming a unique iron chelate, they suppresses iron-catalyzed oxidative reactions and may serve a potent antioxidant function in the preservation of seeds. By the same mechanism, dietary phytic acid may lower the incidence of colonic cancer and protect against other inflammatory bowel diseases. Twelve records in the SoyaScan database show phytic acid to have anticancer activity. In addition, they are one source of dietary phosphorus in the soybean.

(5) Aluminum content of soy formula is 10 times greater than milk-based formula, and 100 times greater than unprocessed milk. Aluminum has a toxic effect on the kidneys of infants, and has been implicated as causing Alzheimer’s in adults. Fact: Aluminium is the most abundant metal in the earth’s surface. It is harmless to humans except for infants with kidney failure—who should not drink soymilk. There is no solid scientific evidence indicating that aluminum causes Alzheimer’s disease; that theory, advocated by a few scientists 10 years ago, is no longer being pursued.

(6) Allergies to soy are almost as common as those to milk. Fact: Roughly 10 to 15 times as many infants are allergic to cow’s milk compared to soymilk. Since 1910 soy-based infant formulas have saved the lives of many infants whose mothers could not breast feed and who were allergic to cow’s milk

The authors conclude that only traditional fermented soy products such as miso, natto, and tempeh, are safe.

About the authors (autobiographical): Sally W. Fallon, M.A. lives in Washington, DC, with her husband and 4 children. A member of the Price Pottenger Nutrition Foundation Advisory Board, she is a regular contributor to their quarterly journal. Mary Enig, PhD, is an expert in the field of lipid chemistry who has conducted many studies on *trans* fatty acids. She is also well known for a career of anti-hydrogenation and anti-margarine research and writing, with funding from the dairy industry. A large percentage of America’s margarine is made from soy oil.

Update: Printout of website named Mercola.com sent to Soyfoods Center by Sjon Welters of Cabot, Vermont. 1998. Nov. 6. The title of this 6-page website is “Avoid soy: Concerns regarding soybeans.” On the last page we read: “The above information was abstracted from an article written by Sally Fallon and Mary Enig, PhD.

(an international expert renown [sic] in the field of lipid chemistry) for Health Freedom News in September of 1995.” Address: 1. M.A.; 2. PhD. Phone: 818-357-2181.

1517. Fujita, Mitsugu; Hong, Kyongsu; Ito, Yae; et al. 1995. Transport of nattokinase across the rat intestinal tract. *Biological and Pharmaceutical Bulletin* 18(9):1194-96. Sept. [11 ref]

• **Summary:** Nattokinase (NK) is reported to cause the degradation of fibrinogen in the plasma of normal rats. It is absorbed from the rat’s intestinal tract. Address: 1-3. Biotechnology Research Laboratories, JCR Pharmaceuticals Co., Ltd., 2-2-10 Murotani, Nishi-ku, Kobe 651-22, Japan.

1518. SunRich. 1995. SunRich (Ad). *Soya Bluebook Plus* 1995-96. p. 59.

• **Summary:** This one-third page black-and-white ad lists three categories of products: (1) Identity preserved specialty soybeans and grains: IP corn; Food quality soybeans available for soymilk, tofu, tempeh, miso, natto, sprouts, and soy sauce; Shipments available in containers, rail or bulk barge.

(2) Soymilk powders: Spray-dried soymilk and tofu; Soy/dairy milk.

(3) Sweet Beans: Frozen green soybeans; Podded (*edamame*) or peeled (*mukimame*).

\* Certified organic soybeans & products available.

Address: P.O. Box 128, Hope, Minnesota 56046. Phone: 1-800-342-6976 or 507-451-3316.

1519. Wilson, Lester A. 1995. Soy foods. In: D.R. Erickson, ed. 1995. *Practical Handbook of Soybean Processing and Utilization*. Champaign, Illinois: American Oil Chemists’ Society Press; St. Louis, Missouri: United Soybean Board. viii + 584 p. See p. 428-59. Chap. 22. [41 ref]

• **Summary:** Contents: Introduction. Soybean chemical composition. Unfermented soy foods: Soymilk, tofu (momen, kinugoshi or silken, packed tofu, aseptically packaged tofu, deep-fried tofu, kori tofu or dried-frozen tofu), other nonfermented soy foods (yuba, kinako or roasted whole soybean flour, fresh {*edamame*} and canned soybeans, texturized soy protein-based foods). Fermented soy foods: Miso, shoyu (soy sauce), natto, tempeh, sufu. Japanese Agricultural Standards. Identity preservation and transportation. Soybean quality characteristics: Overview, judging quality (tofu, miso, natto). Note: This is the earliest English-language document seen (Dec. 2005) that contains the term “roasted whole soybean flour.”

Tables: 1. Nonfermented soy food products and common names by country. 2. Fermented soy food products and common names by country. 3. Chemical composition of soy foods. 4. Per capita annual consumption of soybeans (kg) in selected Asian countries (China, Indonesia, Japan, Korea, Malaysia, Philippines, Thailand; for the years 1968, 1978,

1988, 1994).

Figures: 1. Flowchart of refrigerated and shelf-stable soymilk production. 2. JAS seal of approval. 3. Diagram of equipment used in large scale tofu production (each piece of equipment is numbered and labeled). 4. Flowchart of regular tofu production. 5. Graph showing percent transmittance of whey versus coagulant concentration for soymilks at 6% solids made from Weber, Vinton, and Amsoy soybeans. A concentration of 0.023 N was selected as the optimum coagulant concentration, since it gave the most transparent whey. 6. Graph showing percent transmittance of whey versus coagulant concentration for Amsoy soymilk at concentrations of 4, 5, and 8% solids. Concentrations of 0.018N, 0.019N, and 0.035N, respectively, were selected as optimum coagulant concentrations. 7. Flowchart of kinugoshi (silken) tofu production. 8. Flowchart of packaged tofu production. 9. Flowchart of aseptically packaged tofu production. 10. Flowchart of kori (dried-frozen) tofu production. 11. Diagram of equipment used in large scale production of dried-frozen tofu (each piece of equipment is numbered and labeled). 12. Flowchart of miso production. 13. Diagram of the interactive factors producing the characteristic attributes of miso. 14. Flowchart of tempeh production. Address: Iowa State Univ., Ames, Iowa.

1520. Fujita, Mitsugu; Hong, Kyongsu; Ito, Yae; Fujii, R.; Kariya, K.; Nishimuro, S. 1995. Thrombolytic effect of nattokinase on a chemically induced thrombosis model in rat. *Biological and Pharmaceutical Bulletin* 18(10):1387-91. Oct. [28 ref]

• **Summary:** “Intravascular thrombosis is one of the main causes of a wide variety of cardiovascular diseases. Platelet aggregation and thrombogenesis play an important role in these diseases.” Nattokinase is a fibrinolytic enzyme which cleaves fibrin. Address: 1-3. Biotechnology Research Laboratories, JCR Pharmaceuticals Co., Ltd., 2-2-10 Murotani, Nishi-ku, Kobe 651-22, Japan.

1521. Paine, Heather. 1995. Processing trends in Europe. Paper presented at the Third Bi-Annual SoyAfrica Conference. 14 p. + 11 p. of tables, charts, and graphs. Held 3-5 Oct. 1995 at Johannesburg, South Africa. Organized by Aproma. [10 ref]

• **Summary:** Contents: Introduction. History and production. The benefits of soya: Nutrition, functional properties. Products & applications: oil-based products (soya bean oil, soya lecithin), soya protein products (full-fat soya flours, defatted soya flours, soya concentrates, soya isolates), soya fibre products (incl. soy bran), whole soybean products or soya foods (soya milk or drink, tofu, yuba, soya sauce, miso, tempeh, natto). Trends and problems: Growing market for soy protein ingredients, U.S. soyfoods market, soymilk sales, problems of quality and image and legislation. Address: Editor, Soyfoods, England.



1522. United Soybean Board. 1995. Soybeans: How a little bean becomes an ingredient in thousands of products from margarine to tofu to chicken feed (Brochure). Chesterfield, Missouri: USB. 12 panels + poster. 23 cm.

• **Summary:** This attractive color publication is folded so that the first 12 panels are a brochure. However when fully unfolded, a large color poster appears. The brochure notes: In 1992/93 the USA produced 51% of the world's soybeans. An early history of the soybean in the USA [full of errors]. America livestock (including poultry) consume about 22.5 million tons of soybean meal a year. How soybeans are grown. Composition of the soybean. Foods made from soybeans: Edamame, miso, natto, soy milk, soy sauce, tempeh, tofu or soybean curd, full fat flour. Photos (each incorrect) in the brochure show: "1904: The famous American chemist George Washington Carver discovers that soybeans are a valuable source of protein and oil. 1920s: Combines first used to harvest soybeans. 1922: First U.S. soybean processing plant opens. 1929: Soybean pioneer William J. Morse spends two years in China, gathering more than 10,000 soybean varieties for U.S. researchers to study. 1940: Henry Ford takes an ax to a Ford car body to demonstrate the strength of the soybean plastic he has developed."

The color poster (16 by 27 inches) is a cartoon showing how soybeans are processed into various products, including full fat flakes, crude and degummed soybean oil, soy concentrates, soy isolates, soy flours, and defatted soy flakes. A soybean utilization/processing diagram at the bottom of the poster shows 137 different products that can be made from the soybean, including 33 whole soybean products ("Traditional soyfoods" incl. tofu, soymilk, miso, tempeh, soy sauce, natto), 33 soybean meal products (26 edible uses + 7 feed uses), and 71 soy oil products (13 edible uses, 19 industrial uses, and 18 applications for lecithin). The seven types of lecithin applications are: Emulsifying agent (4 applications), nutritional (medical use, dietary use), anti-spattering agent (in margarine manufacture), stabilizing agent (in shortening), anti-foam agent (yeast manufacture, alcohol manufacture), dispersing agent (in paint, ink, and rubber manufacture, and in insecticides), and wetting agent (in cosmetics, paint pigments, and calf milk replacers).

Accompanying the brochure/poster is a note pad with the same slogan across the top of each sheet: "Soybeans—Designed for life." Across the bottom is written: "United Soybean Board—Investing check-off dollars." Address: P.O. Box 419200, St. Louis, Missouri 63141-9200.

1523. Lorenzen, Jerry. 1995. Breeding soybeans for food uses. Interest in tofu (Interview). *SoyaScan Notes*. Nov. 17. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Jerry is a soybean geneticist. He develops soybean lines used for making tofu and natto, and also

develops commercial soybeans. Over half of his work is breeding soybeans for food uses. A lot of his work is trying to incorporate the right protein and oil contents, along with agronomic characteristics. Jerry graduated from Iowa State University. While in high school, he worked at Pioneer Hi-Bred's production facility at Reinbeck, Iowa. In college he worked as an intern for the Asgrow experimental station in Ames, Iowa. There he learned a lot of his breeding techniques and philosophies on soybean breeding. His interest in the benefits of soybeans for human nutrition grew out of his interest in their benefits for animal nutrition. He grew to believe that soy would someday come to be widely used in human diets. He has two kids and he wanted to find ways to include tofu in their diets. He wanted to find ways that they would like tofu.

In the early 1980s, he started his own soybean breeding company in Fremont, Iowa. He has his own crossing and selection programs. He believes that there is a very bright future for soybeans and tofu. One of his goals is to incorporate more soy into the typical American's diet. Bee-Lor Inc. believes that many nutritional benefits come from including soy as part of the diet—even if you don't change your tastes or the way you eat. He and his partner and good friend Tim Beeler met while working for the Ralston Purina Co. in the area of hog and cattle feeds. Tim left Ralston in about 1986 to start a specialty meat shop with his brothers in Des Moines, Iowa. Jerry left in 1989 to focus on his soybean breeding business. Tim made a very popular, high-quality bratwurst using lean pork and the best ingredients an old family recipe. Jerry approached Tim with the idea of creating a hot dog-type bratwurst product that contained tofu, as a way of introducing tofu into mainstream America. Jerry said: "The first time I want people to taste tofu is in something that they are used to eating." Then their first impression of tofu will be a good one and they will say, "Hey, tofu tastes good." But tofu is a tough sell in the Midwest. Jerry loves tofu, and likes to eat it just like it is. He even gets a craving for tofu at times. Address: Vice-President, Bee-Lor Inc., 103 North Third St., Oskaloosa, Iowa 52577. Phone: 515-673-1930.

1524. Idowu, I.A.; Osho, Sidi. 1995. An update of soybean food technology generation and transfer problems in Nigeria: A review of experiences. Paper presented at Conference on Postharvest Technology and Commodity Marketing in West Africa. 8 p. Held 27 Nov.-1 Dec. 1995 at Accra, Ghana. [8 ref]

• **Summary:** Published in 1998 under the title "A review of experiences with soybean food technology generation and transfer in Nigeria," in Ferris, R.S.B., ed. 1998. *Postharvest Technology and Commodity Marketing in West Africa. Proceedings of a Conference...*

Contents: Introduction. Agricultural technology generation and transfer concepts. The issue of untapped human resources for technology generation and transfer.

The prospects for soybean production in Nigeria. Processing and utilization of soybean. Utilization classes and forms of soybean products (fermented products such as soy-ogi or dawadawa, soy-milk, meat substitutes). Important points on soybean processing and utilization: Acceptability of soybean product, suitability of equipment, misinformation about soybean products, profitability. Improving the status of soybean production, processing, and utilization in Nigeria. Address: 1. Coordinator, lecturer of the Dep. of Agricultural Extension and Rural Development, Univ. of Agriculture, Abeokuta, Nigeria and Socio-Economic Consultant on the IDRC/IITA Soybean Utilization Project; 2. Food Technologist, Grain Legumes Improvement Programme, IITA, Ibadan, Nigeria and Coordinator, IDRC/IITA Soybean Utilization Project.

1525. Kanno, Akishige; Takamatsu, Haruki. 1995. Studies on natto. V. Determination of gamma-polyglutamic acid in natto using cetyltrimethylammonium bromide]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society of Food Science and Technology)* 42(11):878-86. [27 ref. Eng; jap] • **Summary:** A simple and rapid spectrophotometric method has been established for determination of gamma-polyglutamic acid (gamma-PGA) which is the sticky material in fermented soybean food natto. The method is based on the complex formation between gamma-PGA and cetyltrimethylammonium bromide (CET) (from journal@rchive). Address: Asahi Shokuhin Co. Ltd., 180-2 Wado, Ushibori-machi, Namekata-gun, Ibaraki, 311-24, Japan.

1526. Kushi, Michio. 1995. Guide to standard macrobiotic diet: Kushi Macrobiotics Corp. edition. Becket, Massachusetts: One Peaceful World Press. 64 p. Nov. Illust. No index. 22 cm. • **Summary:** Introduction. Part I—Basic principles of standard macrobiotic diet. Part II—Summary of daily dietary recommendations. Part III—Standard macrobiotic dietary practice: Whole grains, soup (incl. miso soup), vegetables, beans (incl. azuki beans, black soybeans, tofu, dried [frozen] tofu, tempeh, natto, okara), sea vegetables, fish and seafood, fruit, pickles, nuts, seeds snacks, condiments, seasonings, garnishes, desserts, beverages, modifications, helpful eating hints. Part IV—Proposed one week meal planner. Macrobiotic resources: The Kushi Institute, The One Peaceful World Society. Kushi Macrobiotics Corp. background (formed in May 1994 to market a line of natural, macrobiotic foods). Michio Kushi: Brief biography (Age 69, he is Chairman of the Board and Director of Research of Kushi Macrobiotics Corp.). On the rear cover is a portrait photo of Michio Kushi with his autograph in both English and Japanese.

Note: This book is designed to promote the Kushi Cuisine line of macrobiotic foods. A half-page black-and-white photo of that line of foods is shown facing the inside rear cover. The slogan is: “Perfect replacements for imperfect

foods.” Kushi Macrobiotics Corp. is located at Three Stamford Landing, Suite 210, Stamford, Connecticut 06902. Phone: 203-973-2929. Address: Becket, Massachusetts.

1527. *Ontario Soybean Growers' Marketing Board Newsletter*. 1995. Profiles: W.G. Thompson & Sons Ltd., white hilum soybeans and Ontario's railroad system. Dec. p. 7.

• **Summary:** John O'Brien, Manager of W.G. Thompson & Sons Ltd., predicts that premiums for white hilum soybeans will virtually disappear within five years. Instead, more soybean growers will be locking in premiums by growing special varieties that companies such as Thompsons will contract and ship for specific Asian customers. “Thompsons, a \$300 million a year family-owned business with 300 employees, has already earned a name in special quality crops. From its 14 Ontario elevators, the company works with farmers on 75,000 to 100,000 acres of contract crops each year, with over half that acreage going to soybeans.”

White hilum soybeans have become just another commodity in Ontario, says Wes Thompson Jr. The future lies in going the next step, in sitting down with customers and finding out exactly what they want in a soybean, and then producing and shipping those soybeans for them as part of a long-term relationship. Thompsons is already contracting specific varieties for exclusive delivery to individual Pacific Rim makers of tofu, miso, and natto. At Pain Court, the company is also installing a high-tech sorting line that will enable it to sort for shape and color, and to completely eliminate foreign material. At the same time, Thompsons isn't getting out of the huge and profitable crush market. To prove that, it is playing a leading role in the campaign to save Ontario's rural rail network. Thompson's Hyland Seeds Division sold 14 private and 8 SeCan (public) varieties in 1995; it expects to sell 24 private and only 4 SeCan varieties in 1996. Address: Box 1199, Chatham, ONT, Canada N7M 5L8.

1528. Nikkuni, Sayuki; Karki, Tika B.; Vilkuh, K.S.; Suzuki, T.; Shindoh, K. 1995. Mineral and amino acid contents of kinema, a fermented soybean food prepared in Nepal. *Food Science and Technology International (London)* 1(2):107-11. \*

1529. Sarkar, P.K.; Tamang, J.P. 1995. Changes in the microbial profile and proximate composition during natural and controlled fermentations of soybeans to produce kinema. *Food Microbiology* 12:317-25. [25 ref]

• **Summary:** The most acceptable kinema, made in the shortest fermentation time (by far), was made by fermenting sterile soybeans with a pure culture of *Bacillus subtilis*. The *Bacillus* count in the kinema made by the pure culture fermentation was 6.4 times higher than that of naturally fermented kinema. Yet the composition of the two types of

kinema was similar. Address: 1. Microbiology Lab., Dep. of Botany, Univ. of North Bengal, Siliguri-734 430, Darjeeling District, West Bengal, India. Tamang's present address: Dep. of Botany, Sikkim Government College, Gangtok-737 102, India.

1530. Singh, N. Irabanta; Devi, A. Umabati. 1995. Fermentation prospects of two phylloplane bacteria in traditional *hawaijar* made from boiled soybean (*Glycine max* L.). *J. of Food Science and Technology* 32(3):219-20. \*

• **Summary:** Note: "Phylloplane" refers to surface of a leaf considered as a habitat, esp. for microorganisms.

Hawaijar, an indigenous fermented soybean food of Manipur in the north-eastern hills of India, is traditionally consumed as a fish substitute.

"Fermentation prospects of these two bacteria showed that *Bacillus subtilis* was more suitable than *Xanthomonas* sp. in terms of appearance, texture, odour, flavour and acceptability for the preparation of Hawaijar, a fermented soybean food." Address: 1. Aerobiology, Microbiology and Plant Pathology Lab., Dep. of Life Sciences, Manipur Univ., Canchipur 795 003, India.

1531. Beversdorf, W.D.; Buzzell, R.I.; Ablett, G.R.; Voldeng, H.D. 1995. Soybean. In: A.E. Slinkard and Douglas R. Knott, eds. 1995. *Harvest of Gold: The History of Field Crop Breeding in Canada*. Saskatoon, Saskatchewan: University Extension Press, Univ. of Saskatchewan. ix + 367 p. See p. 153-66. Chap. 13. [14 ref]

• **Summary:** An outstanding history of soybean breeding and production in Canada. Contents: Introduction. Evolution of the soybean crop in Canada. Early breeding efforts. The emergence of soybean as a significant Canadian crop (1940-70). The modern soybean breeding era [1970 on]. Current breeding objectives and methods.

Before 1930, soybeans were "grown primarily for annual forage production when traditional forage crops failed to survive Ontario winters." The appearance of two short-lived soybean crushing facilities in southwestern Ontario [at Milton in about 1930 and Chatham by April 1933] aided the transition of soybeans from a fodder crop to a grain legume crop.

"Evolution of Canada's soybean crop since 1949 reflects the expertise of soybean producers, dramatic improvement in production technology, improved and earlier maturing cultivars, improved domestic processing capacity and significant export market development."

"Soybean in Canada was born in the vision of C.A. Zavitz, arguably a man 50 years ahead of his time. Zavitz, who was head of the Field Crop Department of the Ontario Agricultural College (OAC) meticulously evaluated and selected soybean introductions for both fodder and grain production for 30 years (Zavitz 1927)."

"In 1893, Zavitz planted the first Canadian soybean

crop, probably as a replacement for a field pea that failed to establish that year." Over the years, "Zavitz and two of his colleagues W.J. Squirrel and A.E. Whiteside, evaluated about 100 soybean introductions from the Orient [East Asia] via the United States and Japan for forage and grain production (Zavitz 1927)."

Early soybean breeding in Canada (before 1920) primarily involved the meticulous separation and selection of pure lines from heterogeneous seed introductions. "For example, Zavitz selected and evaluated 34 lines from nearly 10,000 plants from the Habaro cultivar obtained from the" USDA in 1909 (Zavitz 1927).

In 1923 A.E. Matthews and F.W. Dimmock of the Central Experimental Farm (CEF [part of the Dominion Experimental Farms]) conducted a soybean trial at the Harrow Research Station (HRS). "Dimmock continued soybean testing at Harrow until 1929, when Casper Owen took over (Ward 1978)."

The pioneering work of Zavitz (OAC), Dimmock (CEF) and Owen (HRS) to identify and develop soybean varieties adapted to southern Canada created "a base of soybean germplasm and technical knowledge that would support evolution of the soybean crop during and after" World War II.

During and after the war, the main soybean breeders in Canada were C.W. Owen at HRS and F. Dimmock at CEF. Varieties released after 1940 were mainly the result of pollinations among earlier selections from plant introduction and of pedigree selection procedures (Bernard et al. 1988).

The rapid growth in Canadian soybean production in mid-1940s can be attributed to: A large growth in the demand for oil and protein during the war, the appearance of Victory Mills Ltd. in Toronto, improved varieties, promotion and extension efforts by Ivan M. Roberts (of the Field Husbandry Dept. of OAC in 1948 but agronomist for Victory Mills by 1953), and improved inoculant produced by the Microbiology Dept. of OAC. From the 1940s until the late 1970s nearly all of Canada's soybeans were produced in five southwestern Ontario counties: Elgin, Essex (incl. Pelee Island in the middle of Lake Erie; a southernmost point in Canada), Kent, Lambton, and Middlesex (see map near front of book).

Key soybean varieties of the period 1940-1970 are shown in Table 3. One key variety was Harosoy, released by HRS in 1951. Other key soybean breeders were Baldur Stefansson (from 1952) at the University of Manitoba that led to Portage and Altona. G.E. Jones (from 1953) at OAC that led to Vansoy. John Giesbrecht (from 1959) at Morden (southern Manitoba) that led to Morsoy. A.A. Hildebrand was a pathologist who pioneered early research on phytophthora root rot; he worked with Owen to establish a program of disease resistance breeding at Harrow.

The 1960s: In 1961 Dimmock retired from CEF and was replaced by Lorne Donovan as an adjunct to his corn

breeding program. In 1963 Owen retired from HRS and was replaced by R.I. Buzzell. Very early maturing introductions came from Sven Holmberg of Sweden. "Holmberg's material proved to be significant germplasm for Canadian soybeans. He derived it from crosses involving Manchurian and northern Japanese germplasm selected under the cool short-season environments (58°30'N) of Fiskeby, Sweden (Tanner 1973)."

Harosoy 63 dominated Canadian soybean production by the late 1960s. During this decade "two Ontario counties (Essex and Kent) produced nearly two-thirds of the Canadian soybean crop."

In 1974 H. Voldeng took over the soybean breeding program at CEF. In 1976 W. Beversdorf joined the University of Guelph with split responsibilities in soybean and field bean breeding and genetics. In 1982 G. Ablett initiated a soybean breeding program at the Ridgetown College of Agricultural Technology (RCAT). In 1976 CEF released Maple Arrow, a milestone cultivar, with parentage that included a Holmberg line. Maple Arrow, which was well adapted to the short-season areas of Ontario, combined with the higher prices of the early 1970s, sparked a soybean expansion northward and eastward.

The last two sections of this chapter are the longest and most detailed.

Figures show: (1) Graph of soybean production in Canada, 1945-1991. (2) Average yield of soybeans in Canada, 1938-1992.

Tables: (1) Early soybean selections and evaluation (OAC No. 211, Mandarin, Habaro No. 20405, Early Yellow). For each is given: Average height (inches), green fodder production (tons / acre). Yield of grain (lbs / acre). Source: Zavitz 1927.

(2) Early Canadian soybean cultivars (OAC 211 {released 1923}, A.K. (Harrow) {1933}, Mandarin (Ottawa) {1934}, Kabott {1937}, Pagoda {1939}, Goldsoy {1938}). For each is given: Source (pedigree, e.g., Habaro). Institution (e.g., OAC). Year licensed or released (1923-1939). (3) Canadian soybean cultivars of 1940-1970 (Harman {released 1943}, Capital {1944}, Manchu (Montreal) {1944}, Harly {1951}, Harosoy {1951}, Acme {1953}, Comet {1953}, Hardome {1953}, Crest {1957}, Merit {1959}, Portage {1964}, Altona {1966}, Harwood {1970}, Vansoy {1970}). For each is given: Pedigree, institution, year.

(3A) Public and private breeding of soybeans, Canada and USA, 1973-1992. The impact of privately funded soybean breeding programs has increased steadily since 1973, when the first privately bred variety was registered in Canada. This "private" variety was bred by N.R. Bradner in the USA and introduced to Canada by St. Clair Grain and Feed (a division of Maple Leaf Mills Ltd.). In 1973 in Canada there were 170 acres of privately bred soybean seed compared with 14,181 acres developed by publicly funded breeders. In 1982 the figures were 6,066 and 27,354

respectively. In 1987 the figures were 28,148 and 29,960 respectively. And in 1992 the figures were 43,004 acres private and 26,727 acres public. In this 20-year period, 120 private soybean varieties and 51 public varieties were registered. 27% of the private varieties and 81% of the public varieties came from U.S. breeding programs.

(4) Typical breeding cycle in the University of Guelph breeding program. Columns: Year and season, activity, location. The typical cycle is about 8 years. (5) Canadian soybean breeding programs (1991): Columns: Organization (public sector and private sector). Breeder (6 + 5 = 11 breeders in both sectors).

The Ontario Soybean Growers' Marketing Board identified export opportunities for both large-seeded yellow hilum cultivars (for tofu and miso) and small-seeded cultivars (natto type) in Pacific Rim markets. "The first natto-type emerged from CEF [Central Experimental Farm, Ottawa] in 1981, six years after D. Durksen of Continental Grain Company reported the potential export opportunity for small-seeded soybean to Japan. King Grain (N.R. Bradner) and CEF (Harvey Voldeng) each released three additional natto-type cultivars (Nattoking 86, Nattoking 87, Nattoking 88, Canatto, Nattosan and TNS) during the 1980s" (p. 8-9). Address: 1. Ciba Seeds, Greensboro, North Carolina; 2. Agriculture and Agri-Food Canada Research Station, Harrow, Ontario; 3. Ridgetown College of Agricultural Technology, Ridgetown, Ontario; 4. Agriculture and Agri-Food Canada Research Station, Ottawa, Ontario.

1532. Herbst, Sharon Tyler. ed. 1995. The new food lover's companion: Comprehensive definitions of over 4000 food, wine, and culinary terms. 2nd ed. Hauppauge, New York: Barrons. xvi + 715 p. 18 cm. 1st ed. published 1990. Barron's Cooking Guide. [325\* ref]

• **Summary:** This carefully researched and well written dictionary of food terms also contains 21 useful appendixes and a good bibliography. All enquiries should be directed to: Barron's Educational Series Inc., 250 Wireless Blvd., Hauppauge, New York 11778.

Soy and related entries can be found under the following headings: Adzuki bean (also azuki), agedashi, cheese-imitation cheese (generally includes tofu and lecithin), fermented black beans (also called Chinese black beans and salty black beans), flour-gluten flour, kecap manis / ketjap manis, kudzu, milk (see soy milk), miso, natto, okara, queso fresco (also called queso blanco), quinoa, seitan, shoyu (Japanese for soy sauce), soybean, soybean oil, soy flour, soy milk, soy pea (see soybean), soy sauce (light soy sauce, dark soy sauce, Chinese black soy, tamari), tempe or tempeh, tofu (also called soybean curd and bean curd).

1533. Northrup, Christiane. 1995. Heal your symptoms naturally. Potomac, Maryland: Phillips Publishing Inc. 18 p. 28 cm.

• **Summary:** In the section titled “Natural healing for menopause” (p. 1-3) Dr. Northrup advises women to take natural progesterone, since their body stops producing its own progesterone during menopause. This supplement provides relief from both hot flashes and mood swings for many women. “For two weeks out of every month, use a little progesterone cream on the soft areas of your skin, changing sites often... Another form of natural progesterone is plant progesterone. There are many sources. The most common are soy foods and yams (not sweet potatoes).” Also take a safe form of estrogen—estriol. It can be applied as a vaginal cream and may protect against breast cancer. “Natural estrogens such as estriol have been in use for over 50 years, and are considered generic. Although these natural hormones aren’t very common in the U.S., estriol is one of the more popular estrogens in Europe.” To find a U.S. source call the Women’s International Pharmacy at 1-800-279-5708.

“Natural plant hormones with estrogen-like effects are found in soy products, such as soy milk, tofu and miso, in addition to cashews, peanuts, oats, corn, wheat, apples and almonds. Japanese women go through menopause more easily than American women, partly because their diet is so high in the natural estrogens found in soy products. (Note: If you still have your uterus, never take estrogen of any kind without balancing it with progesterone.)”

In the section titled “Natural healing for breast cancer” (p. 6-7) notes that you can lower your risk through diet. “Eat soy products, You can also protect your breasts with tofu. A study published in the September 1994 issue of the *American Journal of Clinical Nutrition* demonstrated that women who ate 60 grams of soy protein per day (about 2 ounces) had changes in the estrogen levels that were similar to the effects of tamoxifen—an antiestrogen drug that is undergoing study as a possible prophylactic agent in women who are at high risk for breast cancer.

“The effects of soy protein on hormonal levels are thought to be from estrogen-like substances in soybeans called isoflavones. These behave like partial estrogen agonists/antagonists, which means they help increase the effects of estrogen in women who have estrogen levels that are too low, while helping to decrease the effects of estrogen in women whose estrogen levels are too high.

“While we’re waiting for more research on the subject, I’d recommend adding soy protein to your diet regularly. In addition to tofu, soy protein is found in tempeh, miso and natto. These products are sold in many grocery stores and in almost all health food stores.” Address: M.D. (gynecologist), Women to Women, Yarmouth, Maine.

1534. Sass, Lorna J. 1995. Lorna Sass’ complete vegetarian kitchen: Where good flavors and good health meet. New York, NY: Hearst Books. xiv + 492 p. Index. 26 cm. [35+\* ref]

• **Summary:** First published in 1992 as *An Ecological*

*Kitchen: Healthy Meals for You and the Planet* (William Morrow—which see). This innovative vegan cookbook offers 250 cholesterol-free recipes. It features a complete glossary of wholesome ingredients for stocking the vegan pantry (no meat, dairy, or eggs). Address: New York City.

1535. Tamang, Jyoti P. 1995. Study of traditional fermented foods production, in the Darjeeling Hills and Sikkim, with emphasis on kinema. Post-doctoral dissertation (food and nutrition), National Food Research Institute, Tsukuba, Japan. Under the United Nations Fellowship Program, Japan. \* Address: Univ. of North Bengal, West Bengal, India.

1536. GEM Cultures. 1996. Catalog [Mail order]. 30301 Sherwood Rd., Fort Bragg, CA 95437. 10 p. Jan. [4 ref] • **Summary:** New additions include *The Simple Soybean and Your Health*, by Virginia and Mark Messina, and a maple tofu kit. Contents: Soycrafters Section: Tempeh, natto, koji starters, miso, koji, tofu boxes, tofu coagulants (natural nigari, Terra Alba naturally occurring calcium sulfate or gypsum). Books. Bread cultures. Dairy cultures. Tea fungus—Kombucha. Sea vegetables. Kitchen items. Ordering information. Address: Fort Bragg, California. Phone: 707-964-2922.

1537. Hagler, Louise. 1996. Soyfoods cookery: Your road to better health. Summertown, Tennessee: The Book Publishing Co. 160 p. Illust. Index. 21 cm. Introduction by Mark and Virginia Messina.

• **Summary:** Contents: Foreword, by Louise Hagler. Introduction, by Mark Messina and Virginia Messina: Introduction, soybeans—a powerhouse of nutrition, soy and cancer (soybeans—a phytochemical factory, genistein and non-hormone cancers, soy and cancer treatment, isoflavones in the diet), soyfoods and heart disease—beyond cholesterol, soyfoods and bone health, soyfoods and kidney disease, menopause, perspective on soyfoods, about the Messinas. Basic soyfoods (glossary): Whole soybeans, fresh green soybeans, soymilk, okara (soy pulp), soymilk powder, soy protein concentrates, soy protein isolates, tofu, freeze-dried tofu, tempeh, textured vegetable protein, miso, soy flour or grits, yuba or bean curd stick or sheet, natto, soy sauce, soy oil, soy lecithin, convenience soyfoods (frozen soyburgers, frozen tamales and burritos, frozen soy hot dogs or wieners, frozen fat-free soy ground meat replacement, frozen soy pizza, tempeh burgers, frozen tofu lasagne, stuffed shells, manicotti, tortellini or ravioli, frozen soy breakfast links or “sausages” or tempeh “bacon,” “ground” tofu, meatless chili mixes, meatless burger mixes, soy “cheeses,” eggless soy mayonnaise, tofu salad dressings, soy ice creams, frozen pot pies, frozen pocket breads, instant miso soup, eggless soy cake, quick bread, pancake and waffle mixes, liquid soy coffee creamer, smoked or baked tofu). Feeding babies and children soyfoods. Breakfast, brunch & bread. Whole

soybeans. Sauces, spreads, dips & dressings. Soup & salad. Main dishes. Desserts. Drinks & yogurt.

No dairy products or eggs are used; honey is called for in some recipes. Optional microwave instructions are sometimes included. Address: Summertown, Tennessee. Phone: 615-964-3571.

1538. Mountain Ark Trading Co.; Macrobiotic Company of America. 1996. The “new” Mountain Ark consumer direct catalog—spring 1996 [Mail order]. 799 Old Leicester Hwy., Asheville, NC 28806. 37 p. March 15. 28 cm.

• **Summary:** This is a very comprehensive mail order catalog, with an excellent index, for macrobiotic whole foods, specialty cookware, cookbooks and books on natural healing, futons, furniture, etc. Soy-related products include: Aduki beans—precooked, amaranth, amazaki concentrate, amazaki [amazake] pickles, arame (sea vegetable), barley malt, black soybeans, brown rice malt, brown rice syrup, cookbooks, dulse (sea vegetable), fu (dried wheat gluten), green nori flakes, hamanatto, hijiki, Hokkaido azuki beans, Hokkaido black soybeans, Japanese plums (*umeboshi*), jinenjo soba, Job’s tears, kamut, kanten bars, kelp granules, kinako, kombu cha, kuzu, miso, mochi, natto miso, natto starter spores, nigari, nori, quinoa, sea palm—California, seaweed sesame shake, seaweed cookbook, seitan, shoyu, soy sauce, tamari, tofu making kit, tofu—dried, wakame. Many of these products are imported from Japan.

Bruce Macdonald of Macrobiotic Company of America acquired the company from Frank Head of Fayetteville, Arkansas, on 1 Feb. 1996. The entire catalog can be viewed on the Internet at <http://www.mountainark.com>. Address: Asheville, North Carolina. Phone: 1-800-643-8909.

1539. Cuptapun, Yaovadee; Varanyanond, Warunee; Hengsawadi, Duangchan; Tungtrakul, Patcharee. 1996. Nutritional evaluation of traditional fermented soybean (tua nao). In: Alex Buchanan, ed. 1996. Proceedings of the Second International Soybean Processing and Utilization Conference: 8-13 January 1996, Bangkok, Thailand. Bangkok, Thailand: Printed by Funny Publishing Limited Partnership. Distributed by The Institute of Food Research and Product Development, Kasetsart University. xviii + 556 p. See p. 220-24. [5 ref]

• **Summary:** Tua nao is a fermented soybean product widely consumed in northern Thailand. The beans are wrapped in banana leaves and the fermentation takes 3-4 days at room temperature. Thua nao is served as a paste or dry chip, and is used in dishes as a flavoring agent.

Three samples of tua nao were purchased in northern Thailand from markets in Lamphoon, Lampang, and Mae Hong Son provinces. The protein quality was investigated. The PER [protein efficiency ratio] ranged from 1.44 to 1.83. The NPU [net protein utilization] ranged from 51.25 to 68. The BV [biological value] ranged from 70 to 81.17. And the

TD [true digestibility] ranged from 75.70 to 84.67.

Valine and methionine were found to be the limiting amino acids in tua nao. It was concluded that tua nao alone is not a satisfactory protein source; it should be consumed with foods that are rich in its two limiting amino acids, such as “fish, shrimp, beef, soybean, peanut, and sesame seed.”

Figures show: (1) A flow diagram for the production of dry tua nao (*tua kab*) and boiled soybeans.

Tables show: (1) Nutritional composition of whole dry soybeans, boiled soybeans, fresh tua nao, and dried tua nao (per 100 gm). (2) Amino acid content (mg/gm of protein) of raw soybean, boiled soybean, fresh tua nao, and dried tua nao. (3) Proximate composition (%) of each of 4 samples of tua nao, and 1 each of boiled soybean, and casein. (4) Vitamin content of tua nao. (5) Essential amino acids (mg/gm of protein) in tua nao and FAO/WHO standard. (6) PER, NPU, BV and TD of tua nao, boiled soybean and casein. Address: Inst. of Food Research and Product Development, Kasetsart Univ., Bangkok 10903, Thailand.

1540. Goulart, Frances Sheridan. 1996. Oh, soy! *Fit* (*New York*). March/April. p. 77-79.

• **Summary:** On the section titled “A nutritional wonder,” the authors notes that soymilk has 15 times more iron than dairy milk, 50% less fat, and no cholesterol. Tofu is one of the two best sources of calcium (yogurt is the other) recommended by the Osteoporosis Foundation for meeting adult calcium needs (1,000 mg/daily). One 4-oz. serving of tofu provides twice as much calcium as one cup of plain yogurt. Soybeans provide the antioxidant vitamins A and E.

A sidebar titled “Your soy shopping list” gives brief definitions of tofu, tempeh, miso, natto, soy milk, soy cheese, soy sauce, and textured vegetable protein (TVP). Address: Connecticut.

1541. Pashupati, Mishra. 1996. Soybean post-harvest practices in Nepal. In: Alex Buchanan, ed. 1996. Proceedings of the Second International Soybean Processing and Utilization Conference: 8-13 January 1996, Bangkok, Thailand. Bangkok, Thailand: Printed by Funny Publishing Limited Partnership. Distributed by The Institute of Food Research and Product Development, Kasetsart University. xviii + 556 p. See p. 124-28. [7 ref]

• **Summary:** Contents: Abstract. Introduction. Cultivation. Harvesting. Cleaning and storage. Processing. Kinema. Future prospect.

In 1993/94 in Nepal, 13,630 metric tons of soybean was produced. “Soybean production in the Mountain, Hill (middle elevation) and Terai (low southern plain) regions were 12.62%, 79.60% and 7.78% respectively. Harvesting, transporting, threshing, cleaning, drying, and storage are done manually.” The time from planting to harvesting in the hilly and mountain regions is about 180 days, compared with only 100 days in the Terai.

The physico-chemical properties of two local varieties were studied.

Figures show: (1) Flow chart of traditional kinema preparation. Incubation is 18-36 hours in a warm and open place. Kinema is an indigenous fermented soybean food unique to Nepal, prepared mostly by the Limbu people (Limbus) of the hilly eastern region. Kinema is a close relative of Japanese natto. It is prepared only at the household level, and its method of preparation differs from home to home, depending on the locality, family convenience, and materials available. It is prepared mostly from raw soybeans, but roasted soybeans are sometimes used if the kinema has to be prepared in a hurry.

(2) Flow chart for preparation of Nepalese soybean snack food. Soybeans are cleaned, roasted, dehulled, aspirated (to blow away the hulls), cracked, oiled with mustard oil, mixed with spices, then packaged.

Tables: (1) Soybean production in Nepal according to ecological region (1993/95). The five columns are: Region, area (hectares), production (metric tons), percentage of total production, yield (kg/ha). The average yield in the three regions is 642 kg/ha; it is highest in the mountains (680) and lowest in the hills (636).

(2) Total production of pulses in Nepal (1992/93 and 1993/94). Production (in metric tons) in 1993/94 is as follows: Lentil 109,530. Grass pea 19,400. Chick pea 18,000. Pigeon pea 16,520. Soybean 13,630. So lentil production is by far the largest and soybean is the smallest. Address: Lecturer, Central Campus of Technology, Dharan, Nepal.

1542. Tamang, Jyoti Prakash. 1996. Fermented soybean products in India. In: Alex Buchanan, ed. 1996. Proceedings of the Second International Soybean Processing and Utilization Conference: 8-13 January 1996, Bangkok, Thailand. Bangkok, Thailand: Printed by Funny Publishing Limited Partnership. Distributed by The Institute of Food Research and Product Development, Kasetsart University. xviii + 556 p. See p. 189-94. [10 ref]

• **Summary:** Contents: Abstract. Introduction. Indigenous fermented soybean food: Kinema, hawaijar. Modified fermented soybean food: Soy-idli (a rice-based breakfast food in south India), soy-dhokla (a wheat-based snack in west India), soy rabadi (a butter milk staple of west India). Non-fermented soybean products: Green [vegetable] soybeans (a snack in north-eastern India), roasted soybean [soynuts] (a snack throughout India), soybean chutney (a condiment / pickle made from whole soybeans in north-eastern India). Commercially available soybean foods: Soymilk, soypaneer [tofu], soysuji / soy-suji (a snack in Central India), soy fortified biscuit (using soyflour).

Kinema and hawaijar are similar to natto of Japan and thua-nao of Thailand; the principal microorganism in both is *Bacillus subtilis*. Two strains were selected to give the best quality kinema. The main determinants of quality are

high viscosity, long sticky strings, and solubilized protein. The optimum fermentation is for 20 hours at 40°C. “The optimized process can be promoted to popularize more consumption of fermented soybean products as a sustainable supply of low-cost nutritious foods.”

Kinema is consumed in eastern Nepal, “in the Darjeeling hills of West Bengal, Sikkim and north-eastern hills of India as a meat substitute in the local diet.”

“The preparation of hawaijar is similar to kinema except the wrapping materials used are leaves of the fig plant (*Ficus hispida* L.) and the fermentation time is prolonged for 3-4 days.

To make soybean chutney, whole dried soybeans are soaked, deep-fried in vegetable oil, then mixed with salt and chilies. This chutney is then consumed like a pickle with boiled rice.

Soypaneer is a very good substitute for traditional dairy paneer, a semi-soft mild-flavoured fresh cheese, which is significantly more expensive than its soy counterpart. Soypaneer is deep fried, mixed with vegetarian curry, and sometimes used to make paneer pakoda [pakora], a local recipe.

Note: A pakora is a fritter—any kind of food coated in batter and deep fried.

Soysuji can be used to replace up to half of the wheat suji in the preparation of traditional Indian recipes.

“Cereal-based Indian diets are generally deficient in protein and calories. The protein intake in the local diet is not enough due to high prices of meat and dairy products as well as religious taboos.”

Tables: (1) Soybean-based foods in India. The four columns are: Four types of products and 12 specific product names. Substrate (whole soybean, soybean-rice, etc.). Use (breakfast, snack, etc.). Consumption area. (2) Chemical composition of kinema (two types with very different composition).

Fig. 1 (p. 194) is a flow sheet of the traditional method of preparing kinema in a Sikkim village. After cooking and draining, the soybeans are crushed lightly by a wooden pestle. Firewood ash may be added. Wrap the soybeans in fern leaves, and ferment for 1-3 days to make kinema. Fry to make curry or soup. Address: Microbiology Lab., Dep. of Botany, Sikkim Government College, Gangtok 737 102, Sikkim, India.

1543. Chang, Sam Kow-Ching. 1996. Re: Research on soybeans for making tofu. Letter to William Shurtleff at Soyfoods Center, May 29. 1 p. Handwritten.

• **Summary:** During the past 4 years, Dr. Chang’s laboratory has been very active in tofu research, particularly in developing methodologies for evaluating which soybean varieties are best suited for making tofu and natto. They have compared tofu making using small (120 gm), medium (500 gm), and large (35 kg) methods. Approximately 10 scientific

papers based on this research have been presented at various meetings. Some of them will appear in refereed journals in the near future. Most of their studies are concerned with what physical and chemical factors make a soybean suited for making tofu. They have an automated tofu machine imported from Taiwan for their tofu research. This may be the first such machine in a U.S. university.

During the past 4 years, Dr. Chang has visited more than 20 tofu and natto factories in Taiwan, Japan, China, and the USA. "I am very interested in promoting soyfoods in the United States." Address: Assoc. Prof. and Food Science Coordinator, Dep. of Food and Nutrition, North Dakota State Univ., Fargo, ND 58105. Phone: 701-231-7485.

1544. Cober, E.R.; Frégau-Reid, J.A.; Voldeng, H.D. 1996. Genotype and environment effects on natto quality traits. *Canadian Soybean Technical Bulletin (OSGMB, Chatham, Ontario, Canada)* 1(2):1-2. July.

• **Summary:** "Production of small-seeded natto soybean has increased in eastern Canada during the past decade. This study was conducted to evaluate natto cultivars and experimental lines for some quality characteristics... Two data sets, seven lines grown at five locations in Ontario and Quebec in 1989 and 1990, and fifteen lines grown at the same five locations in 1993 and 1994."

Table 1 contains 8 columns which show quality characteristics important in natto production, based on the means of data set 2: (1) Soybeans lines. The two named varieties are Canatto and Nattosan. Experimental varieties are EX-01 to EX-13. (2) Mean small-seed fraction is the mass of seed which passes through a 5.5 mm (#14) round-hole sieve compared to the mass of the complete sample. Values range from 630 gm/kg for Canatto to 990 gm/kg (i.e., more small seeds) for 5 experimental lines. (3) Percent hard seed is the percentage of seed which failed to imbibe water after soaking for 16 hours. Values range from 28.5 for Canatto to 0.0 for 10 experimental lines. (4) Water uptake is the mass of water absorbed, following soaking for 16 hours, compared to the mass of dry seed. Values range from 1,440 gm/kg for Canatto to 1,270 for EX-11. (5) Seed oil content. Values range from 145 gm/kg for Nattosan to 194 gm/kg for EX-02 and EX-03. (6) Seed sugar content. Values range from 98 gm/kg for Nattosan and two experimental varieties to 109 for three experimental varieties. (7) The aspect ratio is the ratio of minimum to maximum diameter. (7A) The hilum orientation is with the hilum up, in a plane parallel to the hilum. Values range from 0.74 for EX-13 to 0.82 for EX-04. (7B) The side orientation is with the hilum to the side, in a plane perpendicular to the hilum-up orientation and parallel to the long axis of the hilum. Values range from 0.86 for EX-08 to 0.93 for EX-04.

"Several natto quality characteristics have been improved. Natto lines have been developed that have a high fraction of small seeds with a very low level of seeds

with impermeable seed coats. An increase in the level of seed sugar should be a future breeding objective." Address: Eastern Cereal and Oilseed Research Centre, Agriculture & Agri-Food Canada, Ottawa, Ontario, Canada K1A 0C6.

1545. Hunter, Jean B.; Steinkraus, K.E.; Drysdale, A.E.

1996. Value of fermented foods for lunar and planetary stations. Paper presented at 26th International Conference on Environmental Systems. SAE Technical Paper 961416. Held July 1996 at Monterey, California. [35 ref]

• **Summary:** Contents: Abstract. Introduction: What is food fermentation, brief description of the BLSS (bioregenerative life support systems) diet without fermented foods, prior work on CELSS (closed ecological/environmental life support systems—an acronym increasingly replaced by BLSS), diets and menus, escaping the constraints of the CELSS diet, alternatives to food fermentations, particular opportunities for fermented foods, upgrading edible biomass, improved hedonics, convenience advantages, nutritional advantages, top dozen food fermentations for the space program (in descending order of total score): Yeast-raised wheat bread, single-cell lipids (from *Apiotrichum curvatum*; formerly *Candida curvata* D), amasake [amazake] (sweetener), mushrooms from residues, tempeh & related products—tempeh gembus (meatlike texture), vinegar, tapé/tapuy [tapeh], pickled vegetables, idli/dosa breads, dawadawa/natto (meaty flavor), rice wine, soy yogurt (sogurt) and other soy dairy replacers (dairylike).

This paper begins: "Three significant problems with food supply in bioregenerative lifesupport systems are addressable through use of fermented foods. The quantity of inedible and marginally edible biomass can be reduced; the hedonic quality of the diet can be enhanced; and food storage constraints can be relaxed due to the superior keeping qualities of fermented products."

"The crew diet for the lunar and planetary stations is likely to be based on four crops—wheat, soy, and white and sweet potato—which will make up the majority of calories consumed. Rice, salads and a few vegetable crops will add micronutrients and some variety. No animal foods or sugar crops will be produced, and no fruits except possibly strawberries."

"At the lunar station we expect that 85% of calories will be produced on site, with only 15% supplied from Earth. The resupply must include all flesh and dairy foods, spices and flavorants, luxury foods such as coffee and chocolate, imported fats and sweeteners, fruits, nutritional supplements and religious foods to be consumed in the CELSS."

"We are aware of only two sets of work on CELSS menus. Frank Salisbury has published an instructive and highly relevant survey of vegan and vegetarian dietary practices in the context of the space program, based on his 1994 workshop at JSC. One key point is that vegan cuisine and its ingredients—including fermented ingredients—



deserve greater attention by CELSS planners because of their importance to high-closure lifesupport systems.” Address: Cornell Univ., Dep. of Agricultural & Biological Engineering, Room 218 Riley Robb Hall, Ithaca, New York 14853. Phone: 607-255-2297.

1546. Kim, Wonkeuk; Choi, K.H.; Kim, Y.T.; Park, H.H.; Choi, J.Y.; Lee, Y.S.; Oh, H.I.; Kwon, I.B.; Lee, S.Y. 1996. Purification and characterization of a fibrinolytic enzyme produced from *Bacillus* sp. strain CK 11-4 screened from chungkook-jang. *Applied and Environmental Microbiology* 62(7):2482-88. July. [42 ref. Eng]

• **Summary:** The fibrinolytic enzyme (CK) was purified from supernatant of *Bacillus* sp. strain CK 11-4 culture broth and showed thermophilic, hydrophilic, and strong fibrinolytic activity. The optimum temperature and pH were 70 degrees C and 10.5, respectively.

The first 14 amino acids of the N-terminal sequence are identical to those of subtilisin Carlsberg and different from that of nattokinase, but CK showed a level of fibrinolytic activity that was about eight times higher than that of subtilisin Carlsberg. Address: 1-6,8. Dep. of Biotechnology, Inst. of R&D, Lotte Group, Yangpyung-Dong, Youngdeungpo-Gu, Seoul, South Korea.

1547. Sarkar, Prabir K.; Jones, Linda J.; Gore, Willy; Craven, Graham S.; Somerset, Shawn M. 1996. Changes in soya bean lipid profiles during kinema production. *J. of the Science of Food and Agriculture (London)* 71(3):331-28. July. [29 ref] Address: Queensland Health Scientific Services Lab., P.O. Box 594, Archfield, Brisbane, Queensland 4108, Australia.

1548. Liu, Keshun. 1996. Availability of special soybean varieties bred for food uses (Interview). *SoyaScan Notes*. Aug. 7. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Jacob Hartz Seed Company has a special program breeding soybeans for food uses. The four uses on which they focus most are (in descending order of importance): Tofu, natto, soy sprouts, and soy oil (the soybeans are high in stearic acid, a saturated fatty acid, so they require less hydrogenation). Hartz currently has a large supply of each of these types ready for sale. Any potential buyer should contact Keith Thompson, who is in charge of sales and marketing. Address: Project Leader, Soyfood Lab., Jacob Hartz Seed Co. Inc., 901 N. Park Ave., Stuttgart, Arkansas 72160. Phone: 800-932-7333.

1549. Hastings, Carl. 1996. Soybean products in human foods. Paper presented at Regional Workshop on Soybean Processing and Utilization for Central America and the Caribbean. 4 p. Held Sept. 15-18 in Jamaica.

• **Summary:** Contents: Introduction. Soy sprouts. Whole soybeans: Cooked green beans, cooked soybeans, roasted or deep fat cooked soybeans (soy nuts—salted, flavored, etc.,

candy coated, salad topping, bakery ingredient or topping, soynut butter, soy coffee) fermented soybeans (tempeh—*Rhizopus*, natto—*Bacillus*, hamanatto—*Aspergillus*). Cereal blends: CSM (Corn-Soy-Milk), WSB (Wheat-Soy-Blend), other (bulgur, oat, sorghum grits).

Refined soy oil: Solvent extracted, physically extracted, uses, lecithin. Soy protein: Soy flour (full fat, defatted), concentrates, isolates, textured, uses. Hulls. Soy fiber. Soy milk: Liquid, powder, uses (plain, flavored, fortified, blends, instant formula, nutritional beverages, tofu, soy cheese, frozen desserts, yogurt, soymilk film (yuba)). Soy sauce. Soy paste (miso). Soy pulp (okara). Address: Reliv, Inc., Chesterfield, Missouri.

1550. Jacobi, Dana. 1996. The natural kitchen: Soy! 75 delicious ways to enjoy nature’s miracle food. Rocklin, California: Prima Publishing. xii + 244 p. Oct. Index. 22 cm. Series: The natural kitchen. [16 ref]

• **Summary:** Contents: Preface. Acknowledgments. Introduction: Soy and health. All about soyfoods: Traditional soyfoods (tofu, miso, tempeh, soy sauce, soymilk), other Asian soyfoods (okara, yuba, kinako, natto), second-generation soyfoods (soy dairy products, soy deli foods, textured vegetable protein {TVP}, textured soy protein {TSP}, soy isolate (isolated soy protein)), more soy choices (fresh soybeans, dried black soybeans, soy flour, soy grits, soy flakes, soy nuts), cooking with soyfoods (tofu {pressing, freezing, marinating, sautéing and pan-crisping, frying, braising, pureeing, parboiling, storing and handling tofu}, miso, tempeh, soymilk, other soy dairy foods), cook’s notes (herbs, spices and flavorings, nuts, oils, produce, stock, sweeteners).

Soups, appetizers, and first courses. Main dishes. Pasta and light dishes. Side dishes and sauces. Salads, burgers, and kebabs. Desserts. Breakfast and beverages. Mail order sources.

The Preface states: “If you are new to soy, you will find descriptions of soyfoods, from tofu to soymilk... If you already cook with soyfoods, the approximately 75 recipes in this book and their variations will expand your repertoire. These recipes will take you across lines that people who cook with soy rarely approach. The dishes bring familiar and satisfying textures along with flavors that are full and deep. Whether ethnic or classic, they are dishes with verve and elegance.” The author first tasted tofu, with her parents, in 1953, “at the precocious age of eight,” at The Great Shanghai on 125th St. in Manhattan, New York City. Address: Food writer, New York, NY.

1551. Sumi, Hiroyuki; Banba, Takeshi; Kishimoto, Noriaki. 1996. [Strong pro-urokinase activators proved in Japanese soybean cheese natto]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society of Food Science and Technology)* 43(10):1124-27. [9 ref. Eng; jap]

Address: Dep. of Nutrition, Faculty of Health and Welfare Science, Okayama Prefectural Univ., Kuboki 111, Soja-shi, Okayama 719-11, Japan.

1552. SunRich. 1996. Soya food ingredients. Soybeans for: (Leaflet). Hope, Minnesota. 3 p. 28 cm.

• **Summary:** These two closely related leaflets are in black ink on a red letterhead. The first leaflet states that SunRich offers “specialty soybeans... for specific soyafood uses: Consistency. Quality. Identity preserved.” “Our extensive grower base enables us to contract produce soybeans for your special needs. Specific varieties with reduced antinutritional factors (lipoxygenases, trypsin inhibitor enzymes and oligosaccharides, stachyose and raffinose) available.”

“Soyamilk powders: For ingredient or beverage use.” A table describes soya beverage powders, spray-dried soymilk, spray-dried tofu powder, soy/dairy milk replacers.

“Sweet Beans—Frozen green soybeans—Podded [in the pods] (Edamame) or peeled (Mukimame). Certified organic soybeans and products available.”

The second leaflet states: “Tofu varieties—Vinton, Beeson. Soymilk—Yellow or white hila. Sized over 6.7 mm round. Natto—Sized through a 5.5 mm round. Miso—Yellow hila. High soluble sugars. Boiling soybeans—Edamame varieties, yellow or black seed coats, high soluble sugar. Sized over 7.5 mm round screen. Frozen green soybeans. Edamame, mukimame. New varieties and types—High soluble sugars, high protein content, specific fatty acids. Grower base of 500 growers in Minnesota, Iowa, Wisconsin, South Dakota. Produce specific varieties for customers—Container lots, bagged, bulk. Bulk barge. Organic or conventional.” Address: P.O. Box 128, Hope, Minnesota 56046-0128. Phone: (507) 451-3316.

1553. House Foods America Corporation. 1996. Hinoichi products (Leaflet). Los Angeles, California. 1 p. Single sided. 28 cm.

• **Summary:** This single-sided leaflet (8½ by 11 inches) shows a photo and gives a brief description of each of the company’s products, which fall into four categories: (1) Tofu: Regular tofu, 19 oz, water pack. Shelf life, refrigerated: 34 days. Regular tofu, 14 oz. Soft tofu (kinugoshi), 14 oz. Extra soft tofu, 14 oz. Firm tofu, 19 oz or 14 oz. Yaki tofu (broiled tofu), 9 oz. (Japanese label only)

(2) Age: Agé French fried tofu pouches, 6 pack (1.5 oz each). Oagesan 4-pack tofu pouches (1.1 oz each; Japanese label). Atsuage tofu cutlet (5 oz, Japanese label). Jumbo atsuage tofu cutlet (9 oz, Japanese label). Tofu fritter, large (Ganmodoki, 3 = 2.5 oz.). Tofu fritter, small (Ganmodoki, 8 = 2.5 oz.).

(3) Konnyaku: 6 products, incl. 3 Shirataki yam noodle [thin konnyaku noodles].

Natto: Natto fermented soybeans, 4 oz. Mamekoko natto fermented soybeans, 5.4 oz.

A separate but similar sheet shows foods made in Japan by House Foods and sold by House Foods America Corporation. These include Mabo Tofu Sauce (Medium hot or hot), Wasabi (horse radish paste), *Shichimi togarashi* (red pepper mix), *rayu* (hot sesame oil), *Mugicha* (barley tea), stew mixes (beef or cream), and several curry sauces. Address: 526 Stanford Ave., Los Angeles, California 90013. Phone: (213) 624-3615.

1554. Fukutake, M.; Takahashi, M.; Ishida, K.; Kawamura, H.; Sugimura, T.; Wakabayashi, K. 1996. Quantification of genistein and genistin in soybeans and soybean products. *Food and Chemical Toxicology* 34(5):457-461.

• **Summary:** Discusses: Soybeans, soy nuts, soy powder, soymilk, tofu, miso, natto, soy sauce, genistein. Address: 1-3,5-6. Biochemistry Div., National Cancer Center Research Inst., 1-1 Tsukiji, 5-chome, Chuo-ku, Tokyo 104; 1,4. Tsumura & Co., 3586 Yoshiwara, Ami-cho, Inashiki-gun, Ibaraki 300-11. All: Japan.

1555. Hall, John B.; Tomlinson, H.F.; Oni, P.I.; Buchy, M.; Aebischer, D.P. 1996. *Parkia biglobosa*: a monograph. Bangor, Wales, UK: University of Wales. 107 p. Illust. Map. 30 cm. Series: School of Agricultural and Forest Sciences Publication No. 9. \*

• **Summary:** The dried powder from the pods of this tree is often mixed with water to form a drink called *dozim* by the Dagbani tribe of Ghana and called *bololo* in Hausa (northern Nigeria).

Discusses average daily consumption of dawadawa. In Togo, the Cabrais tribe of northern Togo used dawadawa in 90% of their meals whereas the Mobas tribe further north used dawadawa 60 days out of 100. Per capita daily consumption of dawadawa is greatest by far in Nigeria, followed by Benin, then Togo, as follows, in descending order of amount consumed (region / ethnic group or religion, gm per person per day): (1) Northern Nigeria, Muslim, 17. (2) Northern Nigeria, Christian, 14. (3) Western Nigeria, Yoruba, 10. (4) Kodowari, Benin, Anii / Muslim, 7-10. (5) Parakou, Benin,—, 5. (6) Togo, Kayabé, 4. (7) Burkina Faso, Mossi, 3. (8) Ghana,—, 2. (9) Northern Nigeria, Hausa, 1-7. (10) Eastern Nigeria, Ibo, 1.

1556. Ito, H.; Tong, J.; Li, Y.; Li, Y. 1996. [Chinese douchi. I. From itohiki-natto to particle miso]. *Miso no Kagaku to Gijutsu (Miso Science and Technology)* 44:216-21. [Jap]\*

• **Summary:** Tamang (2010, p. 264) gives the title in English as: “Chinese dauchi, from itohiki natto to nonmashed miso.” And he gives the pages as 224-50, in the same volume.

1557. Ito, H.; Tong, J.; Li, Y. 1996. [Chinese douchi. II. From itohiki-natto to nonmashed miso]. *Miso no Kagaku to Gijutsu (Miso Science and Technology)* 44:224-50. [Jap]\*

1558. **Product Name:** [Tsumami Dry Natto for Snacks].

**Foreign Name:** Tsumami Nattô.

**Manufacturer's Name:** Koishiya Shokuhin K.K. KF. Japan Airlines (Marketer).

**Manufacturer's Address:** Ujike 2664, Ujike-machi, Shioya-gun, Tochigi prefecture, Japan. Phone: 0286-82-2220.

**Date of Introduction:** 1996.

**Ingredients:** Natto, kombu.

**Wt/Vol., Packaging, Price:** 80 gm.

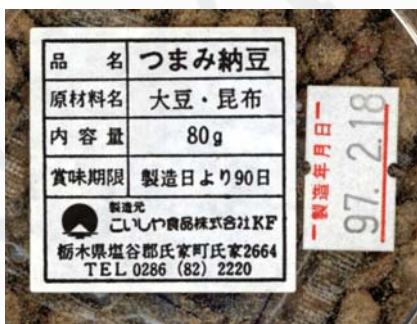
**How Stored:** Shelf stable, 90-day shelf life.

**New Product–Documentation:** Product with Label sent



from Japan by Jean Pearce, writer for the Japan Times. 1997. March. Sold in a cylindrical plastic tub, 3½ inches diameter by 1½ inches deep. Label on the top is self-adhesive, brown and red on yellow. “A natural food. Enriched with vitamin E. Kombu added.”

This natto is in a dry form that can be used as either a



snack or a topping. A *tsumami* is literally “a pinch,”—as of salt. *Beeru no tsumami* means a “side dish for beer.”

1559. Li, Y.; Chun, M.; Zhou, W.; Gang, S.; Ito, H. 1996. [Chinese douche. II. From itohiki-natto to particle miso].

*Miso no Kagaku to Gijutsu (Miso Science and Technology)* 44:244-50. [Jap]\*

1560. Nikkuni, Sayuki. 1996. Fermented food in Nepal. *J. Cook Science Japan* 29:234-39. \*

1561. Hosking, Richard. 1996. A dictionary of Japanese food: Ingredients & culture. Boston, Rutland, Vermont, Tokyo: Tuttle Publishing. 239 p. Illust. by Richard C. Parker. Index. 21 cm. [16 ref]

• **Summary:** This appears to be the same as the original 1972 edition. An excellent, accurate book. The basic entry for each word is given under its Japanese name (thus *daizu* rather than soybeans). Each entry includes the Japanese term in kana (usually hiragana) and (usually) kanji (Chinese characters). One hundred small illustrations are very helpful.

Here is an example: “*dengaku* (hiragana, kanji) a preparation in which food such as eggplant, taro, konnyaku, or tofu are dressed with a sweetened miso topping and grilled on skewers. Fish *dengaku* is called *gyoden*.”

Seventeen appendices (p. 197-235) give detailed discussions of the following important Japanese foods and related items: Chopsticks. Katsuobushi. The kitchen and its utensils. Kombu. The meal. Miso. Saké. Salt. Sansai. Soy sauce. Sushi. Tea. The tea ceremony. Umami and flavor (incl. MSG). Vegetarianism (incl. Buddhism, *shōjin ryōri*, and *fucha ryōri*). Wasabi. Wasanbon sugar.

The author has lived in Japan since 1973. He holds an M.A. degree from Cambridge Univ. Address: Prof. of Sociology and English, Hiroshima Shudo Univ., Japan.

1562. Masuda, Koh. editor in chief 1996. Kenkyusha's new Japanese-English dictionary. 4th edition. Tokyo: Kenkyusha. xiii + 2111 p. 27 cm. [Eng; jap]

• **Summary:** The first edition of this superb dictionary was published in 1918, the second in 1931, and the third in 1954. Some of the definitions of soy-related terms in this edition are quite poor.

Examples:

Edamame: “green soybeans.” Better: Green vegetable soybeans, or Edamamé.

Kōji: “*koji*.” Good.

Miso: “*miso*.” Good. Also defines: Miso-koshi: a miso strainer; Miso mame: a soybean. Misoshiru: miso soup.

Nattō: “fermented soybeans.” Better: Whole soybeans fermented with *Bacillus subtilis*. Nattō-jiru: “Miso soup with minced fermented soybeans.” Good.

Omiotsuke [Jap: Misoshiru] See miso [Miso soup; word used by women only].

Otsuke [Jap: Misoshiru] Miso potage (soup).

Shōyu: “soy (sauce).” Should say: Soy sauce. The word “soy” no longer refers to soy sauce.

Tōfu: “bean curd [cheese]; *tofu*. Yaki-dofu: “roasted bean curd.” Tofu itcho: a piece [cake] of bean curd. Tofu-ya:

“a tofu dealer [seller, maker].”

Tônyû: “soybean (soya) milk.” Better: Soymilk, soya milk, or soybean milk.

Yuba: “dried bean curds.” Should say: The thin protein-lipid film formed atop soymilk when it is heated.

Neither nomamé nor tsurumame, both referring to the wild soybean, are entries in this dictionary.

Non soy: Azuki (characters small + bean): “an adzuki [adsuki] bean.” Azuki aisu: “adzuki-bean sherbet.” Azuki-kayu: “adzuki-bean gruel.” Azuki-han: “rice boiled with adzuki beans.” Azuki-iro no: “reddish-brown or russet” in color. Kintoki-azuki: “a large kind of adzuki bean.” Kintoki-mame: “adzuki beans cooked with sugar.” Mochi: “rice cake.” Yôkan: “sweet jelly of beans; a fine sweet paste.” Mizu-yôkan: “soft adzuki-bean jelly.” Mushi-yôkan: “steamed adzuki-bean jelly.” Yôkan-iro: “a liver [rusty] color; a faded color (as of clothes).” Note: The character *yô* in *yôkan* means “sheep” and can also be pronounced *hitsuji*. Zenzai: “thick bean-meal soup (with sugar and rice cake [mochi]).”

1563. Steinkraus, Keith H. ed. 1996. Handbook of indigenous fermented foods. 2nd ed., revised and expanded. New York, Basel, and Hong Kong: Marcel Dekker, Inc. xii + 776 p. Illust. Index. 26 cm. Food Science and Technology Series, Vol. 73. Index. 26 cm. [350 + soy ref]

• **Summary:** This 2nd edition is about 108 pages longer than the original 1983 edition. Contents: Introduction to indigenous fermented foods. (1) Indonesian tempe and related fermentations: Protein-rich vegetarian meat substitutes. (2) Indigenous fermented foods involving an acid fermentation: Preserving and enhancing organoleptic and nutritional qualities of fresh foods. (3) Indigenous fermented foods involving an alkaline fermentation. (4) Indigenous fermented foods in which ethanol is a major product: Type and nutritional significance of primitive wines and beers and related alcoholic foods (incl. Chinese koji (big *qu* {bricklike in shape and made from barley or wheat and soybeans, inoculated with *Aspergillus*} molds), and small *qu* ({spherical, plate-circular or rectangular in shape and made from rice or rice bran with various herbs, inoculated with *Mucor* and/or *Rhizopus* molds}, p. 449), Japanese amazake (p. 480-81).

(5) Indigenous amino acid / peptide sauces and pastes with meatlike flavors (p. 509-654): Introduction.

(A) Soy sauces: Japanese shoyu: Koikuchi, usukuchi, and tamari; Chinese chiang-yu, by Tamotsu Yokotsuka (p. 511-17). Biochemistry of *Saccharomyces* (*Zygosaccharomyces*) *rouxii*, by Steinkraus, Franta, and Ayres (p. 517-24). Umami flavor, by Kawamura and Kare (p. 524-28). Chinese fermented products related to soy sauce (big *qu*, small *qu*, and jiang, by Chen & Ho, p. 528). Taiwanese soy sauce, by Liu (p. 528-33). Malaysian soy sauce: Kicap, by Ong, Mercian, Poesponegoro and

Tanuwidja (p. 531-39). Indonesian soy sauce: Kecap, by Saono, Poesponegoro and Tanuwidja (p. 539-43). Korean soy sauce, by Chang (incl. homemade kanjang and meju, p. 543-44). Taiwanese black bean sauce: Inyu, by Jan et al. (p. 544). Philippine taosi, by Steinkraus (p. 544-45).

(B) Fermented soybean pastes: Japanese miso, by Ebine, Shurtleff and Aoyagi (p. 545-56). Indonesian tauco, by Saono et al. and Winarno (p. 556-59). Korean Doenjang and kochujang, by Chang, Shurtleff and Aoyagi (p. 559-64).

(C) Fermented fish-shrimp sauces and pastes (p. 565-606).

(D) Fish-soy sauce and fish-soy paste, by Ismail, p. 607-11).

(E) Miscellaneous Oriental fermentations. Japanese natto (itohiki natto), by Hayashi and Ota (p. 611-24). Japanese Hama-natto (hamanatto) and related products (incl. yukiwari natto, p. 624-26). Chinese red rice: Anka (Angkah), by Lin, Su and Wang, Sooksan and Gongsakdi, and Pichyangkura (p. 626-33). Chinese sufu, by Su and L.-P. Lin (p. 633-41). Preserved duck eggs / Century eggs, Chinese pidan (p. 641-42). Pidans are made by a chemical process, not by fermentation. Note: Chapter 5 contains about 240 references. Much of the text in this chapter is similar to that in the original 1983 edition, although this chapter is 7 pages longer and contains 3-4 new sections.

(6) Mushrooms: Producing single-cell (microbial) protein on lignocellulosic or other food and agricultural wastes.

(7) General papers related to indigenous fermented foods. Address: Inst. of Food Science, Cornell Univ., Geneva, New York.

1564. Tamang, J.P.; Nikkuni, Sayuki. 1996. Selection of starter cultures for the production of kinema, a fermented soybean food of the Himalaya. *World J. of Microbiology and Biotechnology* 12(6):629-35. [23 ref]

• **Summary:** Kinema, a fermented soyfood, serves as source of low-cost protein to the people of the eastern Himalayas. The traditional method of making kinema results in a product with inconsistent quality. Some 45 strains of spore-forming bacteria were isolated from nine samples of kinema collected from local markets in the Darjeeling Hills and Sikkim, India. From these, ten strains of *Bacillus subtilis* were selected as possible starter cultures on the basis of enzyme activities and production of stringiness. Two of these were eventually chosen as the best starter cultures for improved kinema production. Address: National Food Research Inst., Ministry of Agriculture, Forestry and Fisheries, 2-1-2, Kannondai, Tsukuba, Ibaraki 305 Japan 305. Present address of Tamang: Microbiology Research Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1565. Winter, Ruth. 1996. Super soy: The miracle bean. New York, NY: Crown Publishers Inc. 192 p. Index. 21 cm. [106

ref]

• **Summary:** On the cover is written: “This wonder bean can help fight cholesterol, high blood pressure, blood sugar, cancer, ease menstrual and menopause symptoms, and keep a colon healthy. Includes a cookbook of 50 soy recipes from New York’s Natural Gourmet Cookery School.”

Contents: Introduction: The Cinderella bean. 1. How soy protects the heart and blood vessels: Full of fiber, the Eskimo secret omega-3 fatty acids, lecithin and vitamin E, preventing strokes, magnificent magnesium, soy and the Mediterranean diet, foam to wash out cholesterol?, cholesterol competitors—phytosterols, is it thyroid hormone [when thyroxine levels rise, cholesterol falls?], amino acid at work?, could it be the B’s?, is it the flavonoids?, the bean and obesity, high blood pressure and the bean, could it be just avoiding meat and dairy products?, summing it up. 2. How soy protects against cancer: Protease inhibitors, trypsin inhibitors, plant estrogens, polyphenols, terpenes—antioxidants, fighting phytates, maybe it’s due to low-count amino acid, saponins, inositol—the cancer-fighting phytic acid, which soy products have the most anticancer potential?, potential adverse effects of soybeans. 3. How soy helps ease digestive problems: Promoting regularity, calcium and soybeans. 4. How soy is beneficial in diabetic diets. 5. How soy is proving beneficial to women: The soy and the cycle, other hormonal benefits, magnesium, PMS and pregnancy, contraceptive or fertility inducer?, so “B” it, the bones need it, magnesium and bones, boron and bones, it could be the phytates. 6. Soy and men: Soy and sex, protein power. 7. Soy products and their nutritional value: Soybeans, edamame, soybean sprouts, tofu (also known as bean curd and dou fu-tofu), tempeh, soy milk, yuba, soy cheese, okara, soy yogurt, soy sauce, soy oil, soybean lecithin, soy nuts, miso, natto, soy flour, soy powder, soy protein isolates, concentrates and grits, texturized soy protein, convenience of soy foods. 8. Easy ways to add soy to your diet: Some other easy ways to add soy to your diet, sensible soybean use. 9. Recipes: Appetizers, soups, salads, main dishes/entrées, side dishes/breakfast, sauces/dips, desserts. Glossary. Where to get more information. References. Address: M.S., Health and science writer, Short Hills, New Jersey.

1566. Blazek, Zdenek. 1997. Re: G.B.Z. is preparing soy products in the Czech Republic. Letter to William Shurtleff at Soyfoods Center, Jan. 13. 2 p. Handwritten, with signature. [Eng]

• **Summary:** His company is making soy products in the Czech Republic. They have the book titled *Tempeh Production* by Shurtleff & Aoyagi. Now they would like to introduce some new products such as seitan, amazake, koji, soy yogurt, natto, and cheese alternatives.

Talk with a company representative who speaks German. 1997. Feb. 3. The company now makes tempeh and natto. They introduced each product about 18 months

ago. They would like to introduce tofu and seitan as soon as possible. Address: G.B.Z. s.r.o., 68606 Uherske Hradiste, Czech Republic. Phone: +42 632 636 16.

1567. Hartz, Chris. 1997. The early history of Jacob Hartz Seed Co. (Interview). *SoyaScan Notes*. Jan. 13. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Chris’ father is Jake Hartz, Jr. His grandfather, Jacob Hartz, Sr., founded the Jacob Hartz Seed Co. (JHSC), which Monsanto purchased on 21 April 1983. Chris had a 3-year contract, so he stopped working for the company in April 1986. He now runs a wholesale nursery, and does a little seed brokering.

When Jake, Jr., left the company, he left all his files and company history documents at the company; he took nothing with him. Chris did likewise. Chris called Keith Thompson and he said he would be glad to help in any way he could to get early historical documents. Keith said that Terry Hicks in the accounting department is the keeper of the early files. Terry is now in Kalamazoo involved with the Asgrow purchase. When the company was sold to Monsanto in 1983, the biggest story would have been in the *Arkansas Gazette* in Little Rock; it has since merged with the *Arkansas Democrat* to become the *Arkansas Democrat-Gazette*. One interesting historical document was published by Monsanto on the 50th anniversary, probably in 1992. Chris has never seen any early seed catalogs. Chris and his father now share the same building, but Jake is seldom in the office.

When did JHSC first start to sell soybeans? Chris does not know. But if Jacob Hartz, Sr. first brought in 25 bushels of Laredo soybeans in 1926, it would probably have taken the company several years to develop enough seedstock to be able to sell some and keep the rest for seed multiplication.

Chris was responsible for focusing the company on breeding soybeans for food uses, starting in the late 1970s. It all started in about 1975-77 when a Japanese natto manufacturer, Mr. Yaichiro Mogi of Asahi Shokuhin, contacted JHSC and explained that he needed a soybean that was uniform in size and quality to run through his automated factory (that made only natto) to give a uniform product that he could sell as premium natto. He was getting soybeans from China, IOM, and Canada and he couldn’t set up his cookers and fermenters to accommodate all the different soybeans he was getting. He was one of two automated natto manufacturers in Japan at the time. He gave Chris specifications for the natto beans he wanted. Chris happened to have 9 pounds of small-seeded soybeans with a brown hilum that Dr. Hartwig had sent him free of charge. It was a plant introduction with a PI number. The diameter was 5 mm or less. Hartz crossed that small-seeded soybean with Pickett to get rid of the high rate of shattering. They registered the resulting variety as Hartz 936—their first natto soybean. Hartz’s breeding program got into high gear in 1976, when they hired Dr. Curtis Williams; that year they put in their

first greenhouse. Prior to that one of Hartz's field reps, an agronomist named Jimmy Johnson, was doing the crossing; he now works for Stratton Seed Co. Chris hired Keith Thompson in about 1980 as a salesman. When Chris left in 1986, Keith took over the food side of the business.

Chris was never able to get used to Monsanto's way of making decisions. "Decisions took months instead of minutes, as they did in the family-run business. It was very frustrating." Dan Lamberth was the general manager after Monsanto took over; he and Chris did not get along well.

Concerning Roundup Ready soybeans: Chris has heard a number of farmers say that they are very good on fields where there is a weed problem, but if you don't have a weed problem it is very difficult to accept Monsanto's value-added pricing. Chris uses a huge amount of Roundup on his seed nursery. "It is a standby for us. We like it because it kills virtually all weeds but does not harm most of the plants he wants to raise. Our workers are careful with it, as with any chemical, but it is relatively problem-free." In Chris' opinion, from a human health viewpoint of his employees using herbicides on the nursery, there is less to worry about with Roundup than probably any other herbicide. "In addition, we can spray it on our woody ornamentals and it doesn't hurt them—as long as there is no new growth. But it does hurt the redwood and cypress plants.

As far as Chris knows, Hartz never operated a soybean crushing plant to make soybean oil and meal.

In June 1942 the company named Hartz-Thorell split up. Jacob Hartz took the seed side of the company and named it Jacob Hartz Seed Co.; Mr. Thorell took the implement side and named it Thorell Implement. After Mr. Thorell died, his implement company was sold to White Implement—headquartered in Houston, Texas. They handle McCormick-Deering farm machinery. It is now more a wholesale outlet than retail. Address: Stuttgart, Arkansas. Phone: 501-673-2242.

1568. Roller, Ron. 1997. New developments with organically grown soybeans in America (Interview). *SoyaScan Notes*. Jan. 16. Conducted by William Shurtleff of Soyfoods Center.

- **Summary:** The demand for organic soybeans in America is rising rapidly. Ron thinks this has nothing to do with concerns over genetically engineered (transgenic) soybeans such as Monsanto's Roundup Ready soybeans. "Soybeans have become, hands down, the main cash crop (the one that makes the most money) for organic farmers, at least those in the Midwest. Organic growers in the Dakotas and Montana still rely on wheat as their main cash crop, but the corn, wheat, and soybean growers everywhere else rely on soybeans." The demand for organic soybeans is growing faster than the supply—even though the supply is rising. Increasing prices have attracted more and more farmers to growing soybeans organically. The biggest demand is still from Japan, as it has been for the past 4-5 years. As

interest in organic foods has grown in Japan, bigger food manufacturers (primarily of tofu and natto) have started to use organic soybeans. The American food companies that use organic soybeans are still relatively small and few. Ron's company (if you add the organic soybeans Ron exports) may be the single biggest.

The demand for organic natto soybeans from Japan appeared suddenly and is now very large. Acreage that was used to grow organic soybeans for tofu or soymilk suddenly got switched to growing small-seeded organic natto soybeans. Because of that, the acreage used to grow organic soybeans for tofu and soymilk has decreased. Last year the organic soybean crop in the Midwest (especially Michigan and Ohio) was smaller than expected. So the combination of the export demand (mainly to Japan but also to Europe), the loss of acreage to natto beans, the bad crop, and the lack of new growers, has made the price of organic soybeans rise—by about 10%. But remember that the price of organic soybeans were already more than double, very often triple, that of non-organic beans. The highest prices are paid for Vintons and natto beans. It is these premium prices that are so attractive to the organic farmers. "This trend is of great concern to me, and especially the effect it could have on the price of soyfoods. In a free market economy, with lots of farmers looking for value-added crops, you would think that many more of them would start growing organic soybeans. But it is a difficult chasm to cross. A farmer must learn a whole new way of farming, and, he must wait for 3 years before that land can grow organic crops. That 3-year lead time is the big stumbling block; many farmers actually lose money on that land during those 3 years. Some big farmers are now starting to grow organic soybeans, but they getting involved on a gradual basis, adding 50 to 100 acres a year. Those large commercial growers, who have recently switched to growing soybeans organically, are sitting in the catbird seat, and doing extremely well."

In Ron's market, there have been very few questions from consumers about genetically engineered (transgenic) soybeans. "It hasn't become a problem at all for ASP; I think it will be an asset for us—because we don't use them and we can prove that we don't. However a lot of growers want to grow transgenic soybeans." Address: President, American Soy Products, 1474 N. Woodland Dr., Saline, Michigan 48176. Phone: 313-429-2310.

1569. Thompson, Keith. 1997. History of breeding soybeans for use in making natto at Jacob Hartz Seed Co. (Interview). *SoyaScan Notes*. Jan. 20. Conducted by William Shurtleff of Soyfoods Center.

- **Summary:** Hartz got involved with natto and with food soybeans in 1975 when Yaichiro Mogi, founder and president of Asahi Shokuhin, a major Japanese natto manufacturer, contacted Continental Grain in Vancouver, BC, Canada. Bud Currie (phone: 604-684-7292) of Continental was there at

the time and he knows the whole story in detail. Continental Grain then contacted Jacob Hartz Seed Co. in 1975 on behalf of Mr. Mogi. It was probably not until about 1979 or 1980 that Hartz's program to breed natto soybeans began to yield some results. The first natto soybean they bred successfully was their H-24. The small seeded soybeans they had before that shattered so badly (the seeds popped out of the pods before harvest) that after farmers grew it once, they refused to grow it again. Now Hartz has 6 natto varieties. Hartz was one of the first American seed companies to breed soybeans for food use. Hartz is still dealing with Mr. Mogi, as they did more than 20 years ago. He is buying more soybeans direct than anyone else in the business, because he does not go through all the multiple steps of purchasing (importer, then wholesaler) as is typical in Japan. In the early 1980s Hartz added a second customer for natto beans, as they started working with Mitsubishi. Today Mitsubishi and Continental sell natto soybeans bred by Hartz to other natto makers in Japan.

At a rather early date, Mr. Mogi decided that what made a soybean variety good for use in natto could be determined by scientific research. So, long ago, he established a research lab, and they started comparing soybean varieties, looking at several other characteristics (especially the chemical composition) in addition to seed size and hilum color. He communicated his research findings to Hartz, and they started screening based on the criteria that he desired. They started with small seed size and light hilum color, then tried to add more characteristics (such as high sucrose content) into the mix. Of course, Hartz would also like to get a high yield, but they have never been able to get good natto beans that yield well. So they end up sacrificing yield to get the other desired characteristics. "We think we've got the best natto breeding program in the world—by a long shot." Keith doesn't know of any other private company breeding natto soybeans and only a few universities (in Nebraska, Virginia, Minnesota, and South Dakota) are "tinkering around with natto beans." One major problem is that you must start with a very small germplasm pool—typically a southern pool because it is small seed size to begin with. There are some Midwestern and some Canadian natto varieties, yet at least 75% of all natto soybeans exported to Japan are grown in the South—by Hartz, James Dunn, and 2-3 others. Hartz is the largest supplier. Historically, Mr. Mogi has said that a particular soybean variety is good for making natto, many other natto makers start buying that variety. Once a natto manufacturer finds a variety he likes, he would prefer not to change it. Hartz has developed a natto variety that yields better, but Mr. Mogi has refused to accept it, so it probably will die. Hartz's competition (Asgrow, Pioneer, Northrup-King, smaller companies, etc.) are constantly trying to get better yield. The name of the game is to keep the desired natto characteristics but to constantly improve the yield.

Hartz sells two types of soybeans—food and commercial:

50% of its soybeans are sold to food manufactures and the remaining 50% (commercial) are sold to Southern farmers for planting and eventual use as oil and meal. The amount of soybeans sold for food use will continue to increase, but its percentage of the total will drop, because Hartz plans to rapidly expand its production of Monsanto's Roundup Ready soybeans, which are very profitable.

When Keith started in the soybean seed business in 1978, there were less than 10 soybean varieties in the southern United States—in 3 maturity groups. All of these were public varieties, bred at southern universities. Keith came to work for Hartz in 1983. Hartz introduced its first proprietary (private) commercial varieties (for planting by farmers) in 1984. The farmer is interested *only* in yield. Hartz is now looking to South America as an important new market. Address: Food and Export Manager, Hartz Seed, P.O. Box 946, Stuttgart, Arkansas 72160. Phone: 800-932-7333.

1570. Stevens & Associates, Inc. ed. and comp. 1997. U.S. 1997 soyfoods directory. Lebanon, Indiana: Indiana Soybean Development Council. 47 p. 28 cm. [29 ref]

• **Summary:** This second, expanded edition of the directory contains more than 270 company listings. Contents: Foreword. How to use the Soyfoods Directory (incl. Internet access). Daily soyfood guide pyramid (color). Soyfood descriptions (alphabetical): Introduction, green vegetable soybeans (edamamé), hydrolyzed vegetable protein (HVP), infant formulas—soy based, lecithin, meat alternatives (meat analogs), miso, natto, nondairy soy frozen dessert, okara (see soy fiber), soy cheese, soy fiber (okara, soy bran, soy isolate fiber), soy flour, soy grits, soy protein concentrate, soy protein isolate, soy protein—textured, soy sauce (tamari, shoyu, teriyaki), soy yogurt, soybeans, soymilk (soy beverages), soynut butter, soynuts, soyoil & products, sprouts—soy, tempeh, tofu & tofu products, whipped toppings (soy based—"similar to other nondairy whipped toppings, except that hydrogenated soyoil is used instead of other vegetable oils"), yuba. Soybean products chart: From whole soybeans, from soybean meal, from soyoil and lecithin. Soyfood companies by product (products listed alphabetically).

Composition and nutrient content of soyfoods (large table, p. 14). Soyfood companies (alphabetical by company name; Each listing contains address, contact, phone, soy products, product names, distribution, to locate product, classification). Mail-order soyfoods: Soyfood mail order companies (listed alphabetically by company). Soyfood companies by state (alphabetical by state; California has by far the most). Soybean promotion & research organizations (national, and state). Professional associations and industry information resources. Soy cookbooks (19). Soy resource books (10). Soyfood fact sheets and recipes: 1-2 pages each for meat alternatives, miso, soyoil, soy flour, soymilk, tofu, textured soy protein, whole soybeans. Soyfoods directory

survey.

This directory is on the Internet's World Wide Web at <http://www.soyfoods.com>. For more information or suggestions, call 1-800-301-3153. The Internet version of the Directory continues to improve. "The first year saw hits to our site increase from 1,000 the first month to more than 8,000 per month now. We have added a new search engine that makes it easier to find information and a new monthly e-mail newsletter, *Soyfoods USA*, designed to inform media sources, dietitians and consumers about the latest soyfoods information. To subscribe to this popular newsletter, just send an e-mail message to [soyfoods@ind.com](mailto:soyfoods@ind.com) with the words 'Subscribe Soyfoods USA' in the body or subject field."

Talk with Roger Stevens. 1997. March 10. The 1997 directory was first available in January 1997. About 100,000 copies of this directory were printed, and all but 7,000 have already been sent out free of charge. About 77,000 copies were sent to registered dietitians nationwide; all are members of the American Dietetic Association. Another 10,000 copies were sent to the American Association of Family and Consumer Sciences—basically extension personnel at the Cooperative Extension Service in each county; these people provide a lot of consumer information about foods and agriculture. About 500 copies were sent to each of the 20 state soybean development councils. The remaining 6,000 copies were sent to callers who left their name and address at a toll-free answering service. The next step is to do a media tour in Indiana. Traveling with a registered dietitian, they expect to generate a lot of requests from citizens of Indiana. One of the goals is to show other states that if you promote soyfoods in this manner, you will get a lot of interest. Roger hopes to encourage other states to take a more active role in promoting soyfoods. The directory has generated a tremendous amount of information on the part of dietitians who call the toll-free number and have many questions about soyfoods; Roger tries to refer them to people who have the answers—such as 1-800-Talk-Soy. The Indiana Soybean Council has had to hire a new person just to handle the requests for this directory.

Next Roger plans to do a survey of registered dietitians to learn more about their responses to the 1997 directory. He might ask: Did you receive the book? Do you use it? If so, in what way and how often? How many people do you influence with regards to soyfoods as a result of this book? So if each of the 77,000 dietitians influences, on average, 10 people a year, the directory has reached more than 750,000 people. One major goal of this book is to help dietitians include more soyfoods in their own diets and in the diets of their clients. How can we better help you do this? Do you want a cookbook? A starter kit? Shall we include coupons?

From the focus groups he has already conducted, Roger thinks that future editions of the directory will be presented more like a cookbook or recipe book, with the directory in

the back. "People really like the recipes. They just hand them out to their clients. We get requests for 100 books at a time from dietitians, who give the entire book to their clients at classes, in their offices, etc." Roger has the funds to do the research to find out exactly what dietitians want in the way of soyfoods recipes and how they want them organized.

Other possible questions: Which part or parts of the book do you find most valuable? Which do you find least valuable. Is there any information which is not in the book that you wish were included?

Roger would also like to develop for the next edition of this book a graphic presentation of the inside of a typical supermarket showing all the different products which contain soy.

Note: The word "soyoil" is used instead of "soy oil" throughout this directory. Address: Stevens & Associates, 4816 North Pennsylvania Street, Indianapolis, Indiana 46205. Phone: 317-926-6272.

1571. Pearce, Jean. 1997. Getting things done: Starting out on soy. *Japan Times (Tokyo)*. Feb. 12. p. 17. Wednesday. [Eng]

• **Summary:** "Last week's columns reported on recent research pointing to the dietary benefits of soybean products in relieving complaints associated with menopause." Discusses isoflavones and the isoflavone content (in micrograms per gram) of kinako (roasted soy flour, 2,589), roasted soybeans (1,625), edamame (1,354), natto (1,273), regular tofu (509), fried tofu (695), soy milk (357), miso (373), shoyu (16).

Gives several tofu recipes and recommends *The Book of Tofu* by Shurtleff & Aoyagi.

"And finally, kudos to Japan Airlines for creating natto in a palatable form, freeze-dried and flavored... It has been tremendously successful. In two years, total sales amounted to ¥56 million. Just think of all those isoflavones." A photo shows Jean Pearce. Address: Columnist.

1572. House Foods America Corporation. 1997. House Foods America Corporation. Garden Grove, California. 12 p. 28 cm.

• **Summary:** This color booklet is written in 4 languages: English, Japanese, Korean, and Chinese. Thus four blocks of text, each with the same message, appear on each 2-page spread. Contents: Introduction. House Foods products. Tofu & tofu products. Restaurant—Curry House. Factory.

"House Foods Corporation is the biggest spice manufacturer in Japan, selling processed foodstuffs such as curry mix and stew mix products. In 1981, we established the Los Angeles office to introduce Japanese style curry... In 1983 we opened a curry restaurant in Little Tokyo, where our customers enjoy cuisine created with a Japanese sensibility. We also [in 1983] started manufacturing tofu, the healthy food low in fat and high in protein. Tofu has become



increasingly popular in the United States and most grocery stores carry it. In 1997, we established House Foods America Corporation by merging the three enterprises: House Foods Los Angeles Office, which is in charge of the sales of House Foods' products from Japan, Curry House Restaurant, and Hinoichi Tofu manufacturing. The new entity allows us to provide better quality products to our customers. House Foods America Corporation aims to bring the rich Japanese food culture to the United States by providing high quality food products to American customers."

The new factory in Garden Grove makes 3 types of tofu, natto, fried bean curd, and konnyaku. "This factory features state-of-the-art equipment which can produce 150,000 packages of tofu per day." As of March 1997 there are five Curry House restaurants in the Los Angeles area.

Contains many color photos including: Two views of the outside of the new tofu factory in Garden Grove, California. Curry and Chinese Mabo Tofu Sauce packages. Packages of 3 types of Hinoichi Tofu (regular, firm, and soft kinugoshi) plus natto. The inside of a Curry House restaurant. Five views of the equipment in the new tofu factory, including an overview of the production area. Address: 7351 Orangewood Ave., Garden Grove, California 92841. Phone: (714) 901-4350.

1573. Pearce, Jean. 1997. Re: Japan Airlines (JAL) has created a good-tasting freeze-dried and flavored natto. Letter to William Shurtleff at Soyfoods Center, March 1. 1 p. Typed, with signature.

• **Summary:** Jean recently wrote an article about Japan Airlines creating natto a new type of natto—freeze-dried and flavored—which has been very successful. "When your letter arrived today, I had copies of the columns for you and the JAL natto. I also wanted to get the kind that is available at stores. You will have the package soon."

Note: The commercial product was, indeed, tasty and not sticky or stringy like regular stringy natto (itohiki natto). Address: Columnist for the Japan Times, Tokyo.

1574. Tamang, Jyoti Prakash. 1997. Case study on socio-economical perspective of kinema, a traditional fermented soybean food. In: Proceedings of the International Conference on Traditional Foods. Mysore, India: Central Food Technological Research Inst. (CFTRI). See p. 180-85. Held March 6-8, 1997 at CFTRI. [19 ref]\*

Address: Food Microbiology Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1575. Tamang, Jyoti Prakash. 1997. Traditional fermented foods and beverages of the Sikkim Himalayas in India. In: Proceedings of the International Conference on Traditional Foods. Mysore, India: Central Food Technological Research Inst. (CFTRI). See p. 96-116. Held March 6-8, 1997 at CFTRI. [19 ref]\*

Address: Food Microbiology Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1576. Labbé, Max. 1997. Ces étonnants aliments végétaux fermentés et lacto-fermentés [Those astonishing fermented and lactic-fermented vegetable foods]. Auvers sur Oise, France: Published by the author. 116 p. Preface by Richard Hwei-Ming Bau. Illust. No index. 21 cm. [Fre]

• **Summary:** Part III of this popular book, titled "Asiatic Specialties," contains the following sections and subsections (p. 77-103): Chinese and Japanese fermented foods: Shoyu and tamari, miso, umeboshi, nuka pickles, natto, sufu. Characteristics and way of tempeh: Definition, preparation, arrangement of grains before inoculation. Indonesian tempeh: Preparation of the cakes, preparation of the inoculum. Javanese tapé (tapeh) and its culture. American-style tempeh. A color photo on the rear cover shows Max Labbé. Address: 3 rue Emile Level, F- 75017, Paris.

1577. Muramatsu, Kanako; Muraoka, Yasuhiko; Yasui, Akemi; Suzuki, Tadano; Kiuchi, Kan. 1997. *Bacillus subtilis* (natto) KFP 419 ni yoru erasutaaze no seisan [Study on the deterioration of itohiki natto (Formation of struvite)]. *Nippon Shokuhin Kagaku Kogaku Kaishi* (J. of the Japanese Society for Food Science and Technology) 44(4):285-89. [20 ref. Jap; eng]

• **Summary:** When itohiki-natto becomes old, white crystals develop on its surface and its quality as a food greatly deteriorates. The crystal, sold commercially as "struvite," is composed of magnesium, phosphorus, and ammonia. Address: 1. Kyoritsu Women's Univ., 2-2-1 Hitotsubashi, Chiyoda-ku, Tokyo 101, Japan.

1578. Hunter, Jean B. 1997. Research on foods for lunar and planetary stations (Interview). *SoyaScan Notes*. May 6. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** In late 1996 Jean received a \$500,000 grant from NASA (North American Space Administration) to study foods for lunar and planetary stations. They are going to hire a dietitian; they already have a chef and a link with an institutional food manager. They are going to develop vegan and near-vegan recipes, food processing equipment, and menus suitable for use in the future of space exploration in bioregenerative life-support systems.

The basic assumptions are that crews rotate in and out every 6 months—as on the Russian space station *Mir*; 85 to 90% of the food must be produced in outer space, but 10-15% may be supplied by re-supply operations. These latter foods include fats and oils (incl. as butter), sweeteners, hard cheeses, egg whites, etc. Anchovies and bacon bits will be used as condiments. There will be no live food animals (such as chickens or fish) on board. She will continue her research on fermented food. Foods in which both she and Soyfoods Center are interested include Amazake (sweetener),

tempeh—made from whole soybeans or okara (meatlike texture), dawadawa/natto (meaty flavor), soy yogurt (sogurt; dairylike) and other soy dairy replacers, and fermented black soybeans (salt-cured black beans). She is also studying tofu. Jean has recently become a vegetarian (but not a vegan).

This type of research traces its roots back to the 1960s when food uses of algae were studied. Address: Cornell Univ., Dep. of Agricultural & Biological Engrg., Room 218 Riley Robb Hall, Ithaca, New York 14853. Phone: 607-255-2297.

1579. Liu, KeShun. 1997. Agronomic characteristics, production, and marketing. In: KeShun Liu. 1997. Soybeans: Chemistry, Technology, and Utilization. Florence, Kentucky: Chapman & Hall. xxvi + 532 p. See p. 1-24. Chap. 1. Index. [36 ref]

• **Summary:** Contents: Introduction. Origin. Early history in Europe. Early history in North America. Agronomic characteristics: Seed morphology, germination and seedling development, growing stages and maturity groups, seed development, nitrogen fixation, diseases and pests. Harvesting, drying, and storage: Harvesting, drying, storage. Marketing and trading. Grades, standards, and inspection. Variety identification. Food beans and oil beans.

Figures: (1.1) Graph of total annual soybean production in the USA and worldwide from 1955 to 1994. World production increased from 20 million metric tons (tonnes) in 1955 to 138 million tonnes in 1994. Note the huge increases in 1992 and 1994. The United States' share of the total has been dropping since the mid-1970s. (1.2) Pie chart of market share of world soybean production by major producing countries between 1994 and 1995. USA 50.5%, Brazil 18.2%, China 11.8%, Argentina 9.2%, all other 10.3%. (1.3) Structure of a soybean seed (line drawing). Hypocotyl, radicle, micropyle, hilum, epicotyl, plumule, cotyledon, seed coat. (1.4) Stages in germination and early seedling growth (line drawing). (1.5) Map of geographical zones of the American continent where soybean maturity groups are best grown. Extends from OO in southern Canada down to X in southern Central America and northern South America. (1.6) Graph of equilibrium level of soybeans with the temperature and relative humidity of the surrounding air. Moisture content of soybeans is the third variable plotted. (1.7) Graph of allowable storage time for soybeans as functions of bean temperature and percentage moisture content. (1.8) Diagram of the general flow of grain from the farm through the distribution system to the domestic and overseas processor. (1.9) Diagram of a general outline of soybean food use based on classification of oil and food beans. (1.10) Visual differences between oil and food beans (photo). Left: oil beans (3 cultivars in plastic bags). Right: food beans (top and middle are two tofu bean cultivars, bottom is one small-seeded natto bean cultivar).

Tables: (1.1) The U.S. grades and grade requirements for

soybeans. Address: PhD, Soyfood Lab., Hartz Seed, a Unit of Monsanto, P.O. Box 946, Stuttgart, Arkansas 72160-0946. Phone: 870-673-8565.

1580. Liu, KeShun. 1997. Fermented Oriental soyfoods. In: KeShun Liu. 1997. Soybeans: Chemistry, Technology, and Utilization. Florence, Kentucky: Chapman & Hall. xxvi + 532 p. See p. 218-96. Chap. 5. Index. [127 ref]

• **Summary:** Contents: Introduction. Fermented soy paste (*jiang* and miso): Varieties of miso and jiang, koji and microorganisms involved, koji starter and its preparation, Chinese jiang preparation (traditional household method, pure culture method, enzymatic method), Japanese miso preparation (rice koji preparation, treatment of soybeans, mixing and mashing, fermentation, pasteurization and packaging), principles of jiang and miso preparation, major factors in jiang and miso making (raw materials, cooking temperature and time, conditions during koji preparation, proportions of ingredients, fermentation conditions, novel processing for special products). Soy sauce (*jiangyou* or shoyu): Varieties of soy sauce, soy sauce processing (traditional Chinese household method, modern Chinese method, processing of Japanese shoyu, comparison of soy sauce and *jiang* or miso preparations), principles of making soy sauce (action of koji enzymes, fermentation by lactic bacteria and yeasts, color and flavor formation, glutaminase and glutamic acid), chemical soy sauce, progress in soy sauce preparation (use of defatted soy grits or flakes, improvements in treating soybeans, development of an automatic koji-making system, application of microorganisms with specific activities, techniques to shorten production time, improvements in soy sauce clarification), chemical composition, quality attributes and standardization, mycotoxins. Tempeh: Varieties of tempeh, preparation (traditional method, pilot plant method, petri dish method), microorganisms involved, factors affecting tempeh fermentation (starter, dehulling and aeration, moisture, temperatures, acidity, losses of solids), changes during fermentation (general changes, protein, lipid, carbohydrates and other constituents), production of vitamins, storage, nutritional value. Natto: Preparation, microorganisms involved, factors affecting natto quality (raw material, soybean cooking conditions, storage), changes during fermentation, trends in research on natto and *B. natto* (development of novel strains of *B. subtilis*, purification and characterization of key enzymes, studies into genes encoding key enzymes of *B. subtilis*, studies of possible physiological roles of natto). Fermented black soybeans (douchi or hamanatto). Sufu: Preparation, types of sufu, microorganisms involved, effect of mold growth, effect of brine aging.

Figures show: (1) Photo of Chinese chiang, and Japanese red and white miso, each on one of three spoons in a shallow white bowl. (2) Flow chart of a Chinese method for making koji starter from whole soybeans and wheat

bran. Adapted from Shi and Ren (1993). (3) Flow chart of a pure-culture method for making Chinese jiang from whole soybeans (65%) and wheat flour (35%). Adapted from Shi and Ren (1993). (4) Flow chart of an enzymatic method for making Chinese jiang from whole soybeans (65%) and wheat flour (35%). Adapted from Shi and Ren (1993). (5) Flow chart of the manufacturing process for Japanese rice miso [red miso]. Adapted from Fukushima (1981). (6) Diagram of the interactions of basic miso components during miso fermentation. From Shurtleff and Aoyagi (1983) who adapted it from Shibasaki and Hesseltine (1962). (7) Graph of trichloroacetic acid (TCA)-soluble nitrogen (N) contents of miso samples prepared with soybeans cooked at different temperatures for 10 minutes, followed by 0 days or 25 days of fermentation. Adapted from Nikkuni et al. (1988). (8) Graph of temperature and time control curves for different types of Japanese miso during fermentation. Adapted from Shurtleff and Aoyagi (1983). (9) Photo of soy sauce in three different containers: dispenser, small Yamasa bottle, and large Chinese can (Soy, Superior Sauce). (10) Flow chart of a typical manufacturing process for koikuchi shoyu, the most widely used type of Japanese soy sauce. Adapted from Fukushima (1981). (11) Graph (salt content % vs. temperature) Of safety zone for enzymatic digestion of shoyu koji. Protein digestibility and amino acid content in Zone A are better than those in Zone B. From Yokotsuka (1986). (12) Graph of lactic acid fermentation of shoyu mash as a function of time. Adapted from Jose et al. (1976). (13) Flow chart of role of the proteolytic enzymes of koji mold in liberation of amino acids from proteins. Adapted from Fukushima (1985). (14) Chromatogram of organic acids in fermented and chemical [HVP] soy sauce manufactured in the United States. Optical densities vs. retention time. From Fukushima (1979a). (15) Flow chart of traditional Indonesian method for making tempeh from whole soybeans. Adapted from Winarno (1989). (16) Four superimposed graphs of change in pH and organic acids as a function of incubation time during accelerated acidification of soybeans at 30°C. Shows acetic acid, lactic acid, citric acid, and pH. Adapted from de Reu et al. (1995a). (17) Graph of water soluble nitrogen content in the fermentation of soybeans with *Rhizopus oligosporus* during the traditional tempeh process at 25, 30, and 37°C, and with the rotating drum reactor at 36°C. (18) Photo of two chopsticks lifting some Japanese natto from a bowl full of natto; the thin strings connecting the natto above and below are clearly visible. (19) Flow chart of typical method for making Japanese natto from whole soybeans. (20) Photo of Chinese fermented black soybeans (*douchi*) on a white plate. (21) Flow chart of typical method for making Chinese fermented black soybeans from whole soybeans. (22) Photo of cubes of sufu (Chinese cheese) in a shallow white bowl. (23) Flow chart for making Chinese sufu from firm tofu.

Tables: (1) Proximate composition of some traditional

soyfoods (both fermented and nonfermented). (2) Classification of major types of Japanese miso and their chemical composition. Adapted from Fukushima (1979a). (3) Types of soy sauce recognized by the Japanese government and their chemical composition. (4) Comparison between fermented soy sauce and protein chemical hydrolysate [HVP soy sauce]. Source: Yokotsuka (1986). (5) Relationship between cooking soybeans and nitrogen composition and yield of resultant soy sauce. Source: Fukushima (1979b). (6) Detailed composition of fermented Japanese soy sauce (Koikuchi shoyu). Source: Yokotsuka (1986). Includes inorganic components (minerals), organic components, amino acids, organic acids, sugars, solids, etc. (7) Selected enzymatic activities, soluble nitrogen content, and stringiness of natto samples prepared with soybeans cooked under a pressure of 1.5 kg per square cm for various periods. Adapted from Matsumoto et al. 1995. (8) Major responsible microorganisms isolated from sufu made in different parts of China. Column 1 is the genus and species. Column 2 is areas where the sufu is made, including Taiwan and Hong Kong. Adapted from Shi and Ren (1993). Address: PhD, Soyfood Lab., Hartz Seed, a Unit of Monsanto, P.O. Box 946, Stuttgart, Arkansas 72160-0946. Phone: 870-673-8565.

1581. Sarkar, P.K.; Jones, L.J.; Craven, G.S.; Somerset, S.M.; Palmer, C. 1997. Amino acid profiles of *kinema*, a soybean-fermented food. *Food Chemistry* 59(1):69-75. [20 ref]  
Address: 1-4. Government Chemical Lab., Queensland Health, P.O. Box 594, Archerfield, Brisbane, QLD 4108, Australia.

1582. Nagai, Toshirou; Koguchi, K.; Itoh, Y. 1997. Chemical analysis of poly-gamma-glutamic acid produced by plasmid-free *Bacillus subtilis* (*natto*): Evidence that plasmids are not involved in poly-gamma-glutamic acid production. *J. of General and Applied Microbiology (Tokyo)* 43(3):139-43. June. [31 ref]

• **Summary:** A key discovery concerning the role of plasmids in the natto fermentation. "It has been postulated that the *psf* gene on a small plasmid, pUH1 (5.8 kb) regulates positively the synthesis of capsular poly-gamma-glutamic acid (gamma PGA) in *Bacillus subtilis* (*natto*) Asahikawa."

Note: In 1982 there were three known strains of *Bacillus subtilis* (*natto*): Asahikawa, F, and M. Address: Div. of Applied Microbiology, National Food Research Inst. (NFRI), MAFF, Tsukuba 305, Japan.

1583. *SoyaScan Notes*. 1997. How different types of bacteria reproduce and the amount of heat required to kill them (Overview). Sept. 28. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** What are bacteria? They are tiny, one-celled organisms that can usually be seen only with the aid of a

microscope. Millions of them would fit on the head of a pin. Bacteria (and blue-green algae) are distinguished from other living things because of their cell structure: they have no distinct nucleus—that is, their nuclear matter is not enclosed by a cell membrane or wall, and they lack most of the internal cell structures found in the cells of higher organisms. All bacteria have a cell wall surrounding a cell membrane, inside of which lies the unbound nuclear matter and other material. There are three types of bacterial cells, based on shape: spherical (coccus), rodlike (bacillus), and spiral (spirillum). In terms of evolution, bacteria are the most successful of all creatures.

Are all bacteria bad? No! Some bacteria (popularly called germs) cause disease and sickness. Others are responsible for the spoilage of food. Yet many types of bacteria are essential in making foods—called fermented (or cultured) foods—such as yogurt, sour cream, buttermilk, many fermented cheeses, vinegar, sauerkraut, dill pickles, natto, etc. Other bacteria are decomposers of the biosphere; in nature they cause the decay of stumps, logs, leaves, and other vegetation, which eventually would literally choke our forests and fields. Indeed, without bacteria, there would be no plant or animal life on earth.

How do bacteria multiply? Most bacteria reproduce by dividing in the middle to form two cells. After these cells reach maturity, they divide again to make four. In some species of bacteria, such divisions may occur as often as every 15 minutes. Thus billions of bacteria may be formed from a single bacterium in 24 hours. Others divide only once every 16 hours.

What are bacterial spores? Bacteria of the genera *Bacillus*, *Clostridium*, *Desulfotomaculum*, *Sporolactobacillus* (rods), and *Sporosarcina* (rods) share the ability to form a type of spores, called endospores. Of primary interest to food microbiologists are the spore-forming species of the genera *Bacillus* (aerobic) and *Clostridium* (anaerobic). Endospores, which are formed within the bacterial cells, are very resistant to heat. They are a survival mechanism for the bacteria, because when they germinate, new bacteria are formed—even if the bacteria (vegetative cells) have been killed by heat.

How much heat is required to kill bacteria and their endospores? The heat resistance of microorganisms is usually expressed in terms of their *thermal death time*, which is defined as the time it takes a certain temperature to kill a stated number of organisms (or spores) under specified conditions. The heat resistance of vegetative cells of bacteria varies widely with the species, but even the most difficult to kill (the thermophiles) are killed in several minutes at 80 to 90°C. Generally, the higher the optimal and maximal temperatures for growth, the greater the resistance to heat. Bacteria which clump considerably or form capsules are more difficult to kill than those which do not. Thermal death times of some common bacterial cells: *Gonococcus*:

2-3 minutes at 50°C. *Staphylococcus aureus*: 18.8 minutes at 60°C. *Escherichia coli*: 20-30 minutes at 57.3°C. *Staphylococcus thermophilus*: 15 minutes at 70-75°C. *Lactobacillus bulgaricus*: 30 minutes at 71°C.

Thermal death times of some common bacterial spores: Time (in minutes) to kill all at 100°C: *Bacillus anthracis*: 1.7 minutes. *Bacillus subtilis* (the natto bacterium): 15-20 minutes. *Clostridium botulinum* (causes botulism): 100-330 minutes. *Clostridium calidotolerans*: 520 minutes. Flat sour bacteria: Over 1,030 minutes (17.1 hours). These hard-to-kill bacterial spores are usually killed by heating in a retort (pressure cooker) which raises the temperature.

Heat resistance of enzymes: Although most food and microbial enzymes are destroyed at 79.4°C, some may withstand higher temperatures, especially if high-temperature short-time heating is employed.

Bacterial growth in different foods: Very few bacteria grow in acid foods, dry foods, salted foods, or very sweet foods. Thus, it is relatively easy to can tomatoes because they are an acid food. Jams and jellies are protected by their high content of sugar, and often acid. But the amount of heat required to successfully can nonacid foods is very high because of the need to destroy thermophilic bacteria and the very heat-resistant bacterial spores.

Letter from Dr. Keith H. Steinkraus, Prof. of Microbiology, Cornell University, Ithaca, New York. 1997. Nov. 15. "One of the most interesting areas of microbiology today is the 'extremophiles' isolated from volcanoes, and deep pockets in the oceans. Some extremophiles will grow at temperatures above boiling water, for example 220°F. They are proving to be a good source of enzymes operating at high temperatures.

"Regarding the thermal death times of spores: Using a spore concentration of 60 billion spores/ml of *Clostridium botulinum* (suspended in buffer at pH 7.0) the minutes required to kill them are as follows: 100°C—360 minutes, 110°C—36 minutes, or 120°C—5 minutes."

"D-value-decimal reduction time or the time required to destroy 90% of the organisms (their spores) at 120°C (250°F): *Bacillus stearothermophilus*—4.0-5.0 minutes, *Clostridium thermosaccharolyticum*—3.0-4.0 minutes, *Clostridium nigrificans*—2.0-3.0 minutes, and *Clostridium botulinum*—0.1-0.2 minute.

"Source of the above figures—*Modern Food Microbiology*, James M. Jay (D. Van Nostrand, 1978). There are later editions but it is unlikely that the basic figures have changed much.

"Bacteria suspended in water are more easily destroyed. Suspended in oil or fats or in dried smears are much more resistant to destruction.

"Regarding your inquiry concerning heat treatment of brown rice at 15 psi for 35 minutes, it is very unlikely that any microorganisms in your environment or on the brown rice will survive that treatment. Will it taste 'freshly made'?

after two weeks in the pot at summer temperatures? Unlikely but only a taste test will answer your question.”

One of Dr. Steinkraus' MSc students did her research on “tea fungus–kombucha,” and another did his on tempeh bongkrekin toxin. He found that bongkrekin toxin is formed only in the presence of rather high levels of fat as you would find in coconut residue (left after the extraction of fresh coconut milk with water).

1584. *Soybean Digest*. 1997. Pioneer donates soybean lines. Aug/Sept. p. 64.

• **Summary:** According to Clark Jennings, Pioneer's soybean research manager, Pioneer Hi-Bred International recently donated experimental lines of small-seeded soybeans worth over \$1 million to the University of Nebraska, which has a very active food-grade soybean breeding program. The small-seeded soybeans are used mainly for soy sprouts and natto, says George Graef, a soybean breeder at the university.

1585. Fitzpatrick, Michael. 1997. Soy far, so good. *Guardian (England)*. Oct. 25. p. B57.

• **Summary:** This article is mostly about soy sauce. “As for promoting longer life, reports of the Japanese press have declared soya beans to be anti-carcinogenic, especially the revolting fermented soya-bean concoction called natto.”

American consumers already use vast amounts of soy sauce, but to promote it in Europe, Kikkoman sponsors an annual competition in the UK and Germany named “Kikkoman Masters.” Kikkoman asks chefs in these two countries to make their own favorite recipes using Kikkoman soy sauce.

In the UK, Japanese soy sauces are definitely more expensive than their Chinese counterparts, and there are more varieties of Chinese soy sauce on the market to choose from. Yet there are an estimated 7,000 soy sauce makers in Japan—although many of the smaller ones sell only locally or regionally.

The Yamasa company makes and sells three types of soy sauce: regular, table number one with reduced salt, and one made especially for raw fish [*sashimi*]. Two other brands [that are owned by other companies] are Higashimaru (from Osaka) and Kurashi-more (declaring itself top grade and expensive).

1586. *Soya Bluebook Plus*. 1997. Oilseed glossary: Definitions and terms commonly associated with oilseed products or processing. 1998. p. 354-60.

• **Summary:** Acidulated soapstock, activated, amino acids, antioxidant, biodiesel, biotechnology, bleaching, bleaching earth, bolls, Bowman-Birk trypsin inhibitor, bran, break material, cake, canola, canola meal, catalyst, coconut, coconut–desiccated, coconut milk, coconut meal, cold pressed soy oil, cold test, confection sunflower, cooking oil, copra, copra meal, corn bran, corn feed meal, corn flour,

corn germ meal (wet milled), corn gluten feed, corn gluten meal, corn grits, cotton linters, cotton plant by-product, cottonseed–glandless, cottonseed cake (or cottonseed flakes)–mechanical extracted, cottonseed meal–solvent extracted, cottonseed screenings, cotyledon, cracked corn, cracking, crude cottonseed oil, crude soy oil, defatted soy flour, degermed, dehulled–dehulling, degummed soy oil, degumming, deodorized, desolventizer-toaster, diglyceride, drying oil, edamame, edible crude soy oil, edible refined soy oil, emulsifier, endosperm, esterification, expanded–expanding, expeller, extracted–mechanical, extracted–solvent, extruded, extruder, extrusion, fat, fatty acid, feed (feedingstuff), feed grade, fermented–fermenting, flaking, flour, free fatty acid (F.F.A.), full-fat soy flour (enzyme active or heated/toasted), fully refined soy oil, genetic engineering, germ, ghee, gossypol, grain, green vegetable soybeans, grits, groundnut, gumming, high-fat flour, hilum, hulls, hydrogenated vegetable oil, hydrogenization [sic, hydrogenation], hydrolyzed corn protein, hydrolyzed soy protein, isolated soy protein, kibbled soybean meal, Kunitz trypsin inhibitor, lecithin, lecithinated soy flour, linseed meal, linters, lipoxigenase, low gossypol cottonseed meal, low-fat soy flour, malto dextrins [maltodextrins], margarine, maturity groups, meat analogs [meat alternatives], meat extenders, melting point, methyl esters, miso, monoglyceride, natto, nutraceuticals, oil, okara, once refined soy oil, oxidation, palm kernel oil, palm olein, palm stearin, peanut hulls, peanut meal, peanut skins, pellets, polymerization, processing or extraction of oilseeds (also called “crushers” or oil mill operations–solvent extraction, continuous pressing, batch pressing), protein, pulses, raffinose, rancidity, rapeseed meal–mechanical extracted, refining, refractive index (R.I.), rolled or rolling, salad oil, shortening, soapstock, solvent extracted, solvent extracted soybean flakes, soy flour, soy grits, soy protein concentrate, soy protein isolate, soy sauce (incl. that hydrolyzed with hydrochloric acid), soy sprouts, soya, soya lecithin, soybean(s), soybean ground, soybean cake, soybean curd, soybean fatty acids, soybean feed–solvent extracted, soybean flakes and 44% protein soybean meal, soybean flakes and high protein or solvent extracted soybean meal, soybean hay sun-cured ground, soybean hulls (or seed coats), soybean meal, soybean meal–dehulled–solvent extracted, soybean meal–dehulled–mechanical extracted, soybean mill feed, soybean mill run, soybean processor, soybean protein product–chemically modified, soybean seeds–extruded ground, soybean seeds–heat processed, soybean solubles–condensed, soybean solubles–dried, soyfoods, soymilk, soynuts, spinning (to texturize soy protein isolate for food or industrial use), stachyose, steepwater, sterols, sunflower hulls, sunflower meal–dehulled–mechanical extraction, sunflower meal–dehulled–solvent extracted, sunflower meal–mechanical extracted, sunflower meal–solvent extracted, sunflower seed–oil varieties, technical grade refined soy oil, tempeh, textured

soy concentrate, textured soy flour, textured soy protein, toasting, tofu, transgenic, triglyceride, trypsin inhibitors, unsaponifiable matter, unsaturation, vanaspati–vegetable ghee, wet-milled, whole-pressed cottonseed–mechanical extracted, winterized oil, yuba. Address: 318 Main St., P.O. Box 84, Bar Harbor, Maine 04609. Phone: 207-288-4969.

1587. Gonzalez-Watanabe, Yvonne; Watanabe, Joji. 1997. Introducing tofu to Hispanics. Visit to the House Foods America Corp. tofu factory in Garden Grove near Los Angeles (Interview). *SoyaScan Notes*. Nov. 9. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Yvonne and her husband Joji (who first contacted Soyfoods Center on 12 Sept. 1997) are interested in translating *The Book of Tofu* into Spanish and introducing tofu to the Hispanic community, starting in Los Angeles. Yvonne, age 24 was born in the USA, where her parents (who are both from Costa Rica) lived for 30-35 years; her father was a pharmacist. She learned to speak some Spanish at home. Her parents have returned to Costa Rica. Yvonne (who was raised a Catholic) now works in a real estate office and teaches vegan cooking classes at the Kanzeonji Non-Sectarian Buddhist Temple and Shiva Ashram Yoga Center at Mt. Washington in Los Angeles; there both she and Joji practice Zen meditation and yoga. Rev. Ryugen Watanabe, Joji's uncle, is a Soto Zen master, yoga teacher, and the head of this temple. Both Yvonne and Joji are vegetarians, and she is a vegan. Her sister is an editor for *El International*, a big Spanish language magazine located in Miami, Florida.

Yvonne got interested in vegetarianism and soyfoods through Rev. Watanabe. She had had severe migraine chronic headaches for many years. After trying every possible remedy to no avail, she told her uncle, Rev. Watanabe, about her problem. He said simply but forcefully, "It's your diet." She thought: "He's crazy. I have a great diet." In 1994, although she had been eating meat for 30 years, she tried the vegetarian diet he recommended and got quick relief. Following his advice, she began by giving up red meat and pork, then phased out chicken and fish until after 8-9 months she was consuming a vegan diet. As Yvonne began educating herself about vegetarian nutrition, she was looking for alternatives to meats as a source of protein. Rev. Watanabe told her about tofu, and even taught her how to make it at home from whole soybeans. Now Yvonne teaches other people how to make tofu at home.

Yvonne has great admiration for Rev. Watanabe. "He's really great. He's been teaching Zen and Yoga for more than 20 years and he still charges the same, low prices—\$2.00 for a Yoga class. If you can pay, you pay. If you can't, how about rolling some incense. It's wonderful. I've never seen someone so committed to people."

Yvonne has been a vegan ever since and has not had a headache in almost five years. A friend of Yvonne's had migraine headaches that were so bad, she had to give

herself shots. Yvonne suggested that she try switching to a vegetarian diet. She hasn't had a headache in a year. Over the years many of Yvonne's female relatives (her mother, sister, cousin, etc.) have become vegan—largely because they want to lose weight.

Joji, age 36, was born in Tokyo but has lived in the USA since age 6. He speaks Japanese and English and is a financial consultant. Joji graduated from USC, and now works in a corporate environment in real estate financing. His grandmother, Masa Miyai, lives with them. Four years ago they shut down their business selling medical supplies to Latin America. Now they are developing a project to introduce tofu to Hispanics.

On Oct. 18-19 Yvonne and Joji visited Soyfoods Center, where they talked with Bill Shurtleff about their project and book publishing. They photocopied many Spanish-language documents and recipes related to tofu. Upon returning to Los Angeles, they developed a one-page Spanish language brochure on tofu, visited with Margaret Endo in order to arrange for a booth in next summer's Tofu Festival, and began to do research.

Their first research project was a visit to the House Foods America Corp. tofu plant in Garden Grove, Southern California. After a brief meeting with employee Miyuki Nagano, she took them on a walking tour of the plant, so they were able to observe the entire tofu-making process. It is completely automated, except when a worker smooths the curds in the pressing trays before they are pressed. The company employs about 120 people at this facility. Of the 78 workers in the factory (including shipping and receiving), 98% are Hispanic men, but the office workers are all Japanese. The company has its own delivery trucks; its marketing is focused on California, in part because of increased competition from companies outside the state—as in Massachusetts [Nasoya Foods]. The company invites the Hispanic workers to take home tofu, but they don't—probably because they don't know what to do with it. The company has a full test kitchen and laboratory, and Miyuki is interested in developing tofu recipes that Hispanics will like. The company also makes natto at this plant.

Update: Talk with Yvonne. 1997. Nov. 23. Her cousin, Alejandra Jimenez, from Costa Rica has just arrived in Los Angeles to work with her on the tofu project. Alejandra's native language is Spanish but she also speaks perfect English and has a master's degree in English. Another cousin from Costa Rica is part of an all-male rock band, whose members are ages 30-37; all were born and raised in Costa Rica. She served them 3 tofu recipes—which they liked very much: (1) Tofu cubed in miso soup; (2) Chilled tofu, cubed with sesame oil, rice vinegar, and soy sauce; and (3) Crisp freshly deep-fried tofu cubes, with soy sauce. They are interested in using tofu as part of a weight-loss program.

They all went to a Chinese vegetarian restaurant in nearby San Gabriel named Vegetarian Delights. Run by a

Chinese-American lady, it served a delicious dish named Roasted Black Bean Fish, that tasted remarkably like fish—but used tofu instead of fish. Yvonne made friends with the owner. Address: 6029 LaPrada St., Los Angeles, California 90042. Phone: 213-254-1712.

1588. Schorow, Stephanie. 1997. Books—*Golden 'Geisha'*: Brookline author's 'Memoirs' explores mysterious world of Japanese courtesans. *Boston Herald*. Nov. 12.

• **Summary:** *Memoirs of a Geisha*, by Arthur Golden has become a bestseller. "The Japanese call themselves a 'natto' society. A natto is a fermented bean that if you pick one up, they stick together so much, they won't separate."

"'Memoirs' explores this 'natto' world from the perspective of a girl raised" to be a geisha. Address: Massachusetts.

1589. Muramatsu, Kanako; Nagai, Toshiro; Sato, Shizuko; Ochiai, Yuko; Kiuchi, Kan. 1997. [Stimulative effect of phytone on the production of sticky materials in *Bacillus subtilis* (natto)]. *Nippon Shokuhin Kagaku Kogaku Kaishi* (*J. of the Japanese Society for Food Science and Technology*) 44(11):812-15. [20 ref. Jap; eng]

• **Summary:** "The quality of natto depends on the quantity of sticky materials (SM) which are produced by the starter, *Bacillus subtilis* (natto) strain. In this study, we found that phytone, papain-digested soy protein, significantly enhanced the SM production by *B. subtilis* (natto). L-Glutamate was also found to exhibit the same effect" (from journal@rchive). Address: 1. Dep. of Food Science and Nutrition, Kyoritsu Women's Univ., 2-2-1 Hitotsubashi, Chiyoda-ku, Tokyo 101, Japan.

1590. Ontario Soybean Growers' Marketing Board (OSGMB). ed. and comp. 1997. Canadian soyfoods directory. Chatham, Ontario, Canada: OSGMB. 27 p. 28 cm.

• **Summary:** This excellent, complete, and accurate directory was compiled by the Collège d'Alfred of the University of Guelph, under contract with the Ontario Soybean Growers' Marketing Board (OSGMB). The project leaders were Suzanne Lavoie, Charles Goubau, and Ian Walker. The first Canadian soyfoods directory was published in April 1994 (22 pages).

Contents: Foreword—Ontario Soybean Growers' Marketing Board (OSGMB). Acknowledgements from researchers. Table of contents. Soyfood product descriptions: Green vegetable soybeans—Edamamé, meat analogs, miso, natto, okara, soy cheese, soy flour, soy frozen desserts, soy grits, soy isolate fibre, soy lecithin, soy oil, soy protein concentrate, soy protein isolate, soy pudding, soy sauce, soy sprouts, soy yogurt, soymilk (soy drink and soy beverage), soynuts, tempeh, textured soy flour—TSF, texturized soy protein, tofu, whole dry soybeans, yuba. Soyfoods for your health: Heart disease, cancer, osteoporosis, other conditions.

Composition and nutrient value of soyfoods. Soyfood companies by product. Soyfoods companies by province: Alberta (7), British Columbia (21), Manitoba (2), Nova Scotia (2), Ontario (54), Quebec (20). Soyfood companies (105 companies that make or market wholesale soyfoods)—complete listings (address, phone and fax numbers, contact person, products). Soyfoods distributors—complete listings (13). Soybean distributors—complete listings (28). Research information sources—complete listings (24). Soyfoods information sources (23). Canadian soyfoods directory questionnaire.

Spot in *Ontario Soybean Growers' Marketing Board Newsletter*. 1997. Dec. p. 5. The Canadian Soyfoods Directory was launched in November after a two-month delay. "The project was undertaken following numerous information requests from consumers, processors and health professionals." Funded by the Board of OSGMB, it has been mailed to all Registered Dietitians across Canada, and it will soon be available on the Board's website. Address: OSGMB, 180 Riverview Dr., P.O. Box 1199, Chatham, ON N7M 5L8, Canada. Phone: 519-352-7730.

1591. Honda, Kyoko. 1997. Tofu & soybean cooking: The Japanese healthy way. Translated by Kazuhiko Nagai. Tokyo: Graph-sha Ltd. 64 p. Dec. Illust. 26 cm. [Eng]

• **Summary:** This full-color Japanese-style cookbook is loaded with color photos showing both steps in the process of preparing recipes and the finished dishes. Contents: Basic preparations: Parboiling soybeans, draining tofu, reconstituting Kôri-dofu, removing oil from abura-age, toasting okara. 1. Soybean cooking. 2. Tofu & natto dishes. 3. Other dishes from soybeans. Articles (summary of four articles), Chinese cheese "Furu." Address: Sc.D. (Doctor of Science), nutritionist, and lecturer at Women's Junior College of Nippon College of Physical Education.

1592. Kanai, Y.; Kim, H-R.; Kiuchi, K.; Muramatsu, Kanako; Takeyasu, M.; Tanaka, T. 1997. Manufacture of *Chungkuk-jang* with elastase activity. *Food Science and Technology International* (London) 3:251-56. \*

1593. Kim, H-R.; Muramatsu, Kanako; Kanai, Y.; Tanaka, T.; Takeyasu, M.; Kiuchi, K. 1997. Manufacture of chungkuk-jang with elastase activity. *Food Science and Technology, International* (Tokyo) 3:251-56. \*

1594. Kim, H-R.; Muramatsu, Kanako; Kanai, Y.; Tanaka, T.; Takeyasu, M.; Kiuchi, K. 1997. Development of a new soy protein food employing chungkuk-jang. *Food Science and Technology, International* (Tokyo) 3:310-16. \*

1595. Nikkuni, Sayuki. 1997. Natto, kinema and thua-nao: Traditional non-salted fermented soybean foods in Asia. *Farming Japan* 31(4):27-36. Special issue on soybeans and

fermented foods worldwide. [Eng]\*

1596. Sarkar, Prabir K.; Jones, L.J.; Craven, G.S.; Somerset, S.M. 1997. Oligosaccharide profiles of soybeans during kinema production. *Letters in Applied Microbiology* 24(5):337-39. May. [10 ref]  
Address: Government Chemical Lab., Queensland Health, Archerfield, Queensland, Australia.

1597. Horii, M. 1997. Soybean and fermented food culture in the world. *Farming Japan* 31(4):10-12. [Eng]\*

1598. Keussink, Ruth. 1997. Soja und Sojaprodukte [Soybeans and soy products]. Bonn, Germany: Auswertungs- und Informationsdienst fuer Ernaehrung, Landwirtschaft und Forsten (aid) e.V. 28 p. Illust. (Color photos). 21 cm. [14 ref. Ger]

• **Summary:** Contents: Introduction. Market and utilization. Soya in the diet: Protein, fat, carbohydrates, minerals and trace minerals, vitamins. Overview—Soy products: Whole soybeans, soy sprouts, soy oil, soy beverage, tofu, natto, sufu, tempeh, soy sauces, miso, soy lecithin, soy sausages, TVP. Processing soybeans. Soy ingredients and additives: Soy protein isolate, concentrate, soy bulk / fiber (*sojaballastoffe*), fatty acids, lecithin, vitamin E (tocopherol). Product safety. Genetically engineered soybeans. Tips for buying and storing. Recipes. Address: Konstantinstr. 124, 53179, Bonn, Germany.

1599. Kiyama, Yoshihiro. 1997. Nanikato nattô bukku: oru zattô nattô dokuhon [The book of natto]. Tokyo: Keibunsha. 124 p. 21 cm. [Jap]\*

1600. Machida, Shinobu. 1997. Nattô taizen! [The big and complete book of natto!]. Tokyo: Shogakukan. 223 p. Illust. [Jap]\*  
Address: Japan.

1601. Saio, K. 1997. Soybean foods: Nutritionally and industrially valuable. In: Napompeth, Banpot, ed. 1997. World Soybean Research Conference V: Proceedings. Soybean Feeds the World. Bangkok, Thailand: Kasetsart University Press. xxiv + 581 p. See p. 521-26. Held at Chiang Mai, Thailand, 21-27 Feb. 1994. [10 ref]  
• **Summary:** Contents: Abstract. Introduction. Localization of the components seeds and foods. Roles and behavior of the components in soybean food. Physical functionalities of the components. Nutrition and physiological functionalities of the components. Conclusion.

Contains 4 figures (incl. 11 photos and 1 graph) and 4 tables. Table 3, “Chemical composition of main soybean foods (in 100 gm)” includes tofu (regular), abura-age, kori-tofu, yuba, kinako, soybean sprouts, natto, miso (dark yellow), soy sauce (common), TVP [textured soy flour],

isolate, soybeans (Japanese). Address: National Agricultural Research Center, 1-1-3 Kannondai, Tsukuba, Ibaraki, Japan 305.

1602. Sumi, Hiroyuki. 1997. Nattô wa kore hodo kiku: seijin-byô kara genhatsu made [This is how effective natto is: From the illnesses of the elderly to childhood diseases]. Tokyo: Dainamikku Serazu Shuppan. 273 p. Illust. Maps. 19 cm. [Jap]\*

1603. Yu, T’ae-jong; Yu, Young-nan. 1997. Korean foods. Seoul, Korea: Korean Cultural Research Center, Korea University. 200 p. Illust. (color). 22 cm. [30+ ref]  
• **Summary:** *Chongguk-jang*, (fast fermented beans), which could be called Korean natto, is mentioned on pages 14 and 110.

Note: This is the earliest English-language document seen (Jan. 2012) that uses the word “Chongguk-jang” to refer to Korean-style natto.

Also on page 14: “Toenjang chige (Bean paste stew).”

1604. Kristof, Nicholas D. 1998. A lure for athletes and pilgrims: Nagano City, host of the Olympic Winter Games, is home to one of Japan’s greatest temples. *New York Times*. Jan. 4. p. TR13.

• **Summary:** “Americans sometimes are put off by Japanese foods such as natto, fermented soy beans, or basashi, raw horsemeat, but it is difficult to find someone who does not like soba” [buckwheat noodles].

1605. Golbitz, Peter. 1998. Tofu & soyfoods cookery: Delicious foods for a healthy life. Summertown, Tennessee: Book Publishing Co. 176 p. Illust. (3 photos). Recipe index. General index. 21 cm.

• **Summary:** Contents: Preface and acknowledgments. The history of soyfoods. A closer look at soybeans. Soybeans and health: Introduction, malnutrition, cardiovascular disease, cancer, osteoporosis, menopause, more to come. Using soyfoods: Whole dry soybeans, tofu, soymilk, soy flour, textured soy protein, green vegetable soybeans, tempeh, miso, soy sauce, soy protein concentrate, soy protein isolates, natto, soybean oil, second generation soyfoods, meat alternatives, cheese alternatives, soy yogurt, nondairy frozen desserts, mayonnaise and dressings, instant soups and other dry mixes, margarine, lecithin, soynuts and soynut butter, soy sprouts, okara or soy pulp. Basic recipes. Breakfast. Bread. Salads & dressings. Soups & sandwiches. Main & side dishes. Desserts & drinks. Glossary. U.S. & Canadian soyfoods companies. Sources of information on soyfoods. Nutrients in soyfoods.

Contains 125 of Peter Golbitz’s favorite recipes, selected from the works of some of “the world’s leading soyfoods chefs.” A list of these “leading vegetarian and soyfoods pioneers” (all of whose books have been published by



The Book Publishing Co.) appears on the rear cover. Peter (born in 1952) lives with his wife, Sharyn Kingma, and son on a beautiful island off the coast of northern Maine. A color photo of the family appears on the rear cover. Twenty years ago (in 1978) Peter was “first introduced to tofu and the wonders of soyfoods.” A photo of Peter with his book appears in the Book Publishing Catalog of Jan. 1999. Address: President and Founder, Soyatech, Inc., Bar Harbor, Maine. Phone: 207-288-4969.

1606. Lehnert, Dick. 1998. Specialty soybean varieties bring premiums for a price: Markets for food-grade varieties are growing. *Soybean Digest*. Jan. p. 64-65, 68.

• **Summary:** About 120,000 tons of specialty soybeans are now shipped from the USA to Japan each year—about 10% of the food-grade soybeans the Japanese buy. The soybeans must always be kept separate—“identity preserved.” Growers typically get more dollars per bushel, but sometimes get fewer bushels per acre. The soybeans are made into foods such as tofu, tempeh, natto, or miso.

Kim Nill, deputy director for international marketing at the American Soybean Association, keeps tabs on the growing opportunities for specialty soybeans. He says seed companies are finding niche markets for food-grade soybeans.

Last year, Dupont introduced a variety that produces oil high in oleic acid (naturally lower in saturated fats and more heat stable without hydrogenation). Dupont is now working on a low stachyose bean. Pioneer Hi-Bred International grew 7,000 acres of low-linolenic oil beans for a market similar to that of high-oleic acid beans.

A photo shows a combine harvesting specialty soybeans that will be made into tofu.

1607. Indiana Soybean Board. 1998. Indiana soyfoods locator guide: A guide to finding soyfoods in the supermarket and health food store. Lebanon, Indiana: Indiana Soybean Development Council. 48 p. 28 cm.

• **Summary:** This is the first edition of this Guide. On the cover is a paper grocery bag resting on a bed of soybeans and chock full of foods: Veggie Slices (soy cheese), soynut butter, veggie burger, tofu, soymilk, soy flour, plus carrots, celery, and cooking oil. Contents: Food pyramid. Soyfoods descriptions—Meat the Bean: Introduction, green vegetable soybeans (edamame), hydrolyzed vegetable protein (HVP), infant formulas—soy based, lecithin, meat alternatives (meat analogs), miso, natto, nondairy soy frozen desserts, soy cheese, soy fiber (okara, soy bran, soy isolate fiber), soy flour, soy grits, soy protein concentrate, soy protein isolate (isolated soy protein), soy protein—textured (textured soy protein, textured soy flour), soy sauce (tamari, shoyu, teriyaki), soy yogurt, soybeans, soymilk—soy beverages, soynut butter, soynuts, soybean oil & products, sprouts—soy, tempeh, tofu & tofu products, whipped toppings—soy-based,

yuba. A taste for health—Scientists are learning about soy’s health benefits: Heart disease, osteoporosis, menopause, cancer, isoflavones. Soyfood icon chart. Soyfood facts & recipes: Meat alternatives, soybean oil, textured soy protein, whole soybeans, soy flour, soymilk, tofu. Composition and nutrient content of soyfoods. Soyfood conversion charts: description of one serving of soyfoods, guide to modifying recipes, soyfoods substitution chart. Mail order soyfood companies. Soyfoods Web site packed with information. Soy cookbooks. Soy resource books. 1-800-talksoy. Soyfoods market search map; where to find soyfoods in the supermarket (a two page color layout of a supermarket displaying where soyfoods are located). Soybeans... they’re in almost everything. Finding soyfoods at the supermarket (store listings by county). Address: Indianapolis, Indiana 46205-1744. Phone: 1-800-275-7679.

1608. Stevens & Associates, Inc. ed. and comp. 1998. U.S. 1998 soyfoods directory. Lebanon, Indiana: Indiana Soybean Development Council. 47 p. 28 cm. [33 ref]

• **Summary:** This third edition of the U.S. Soyfoods Directory was produced for the Indiana Soybean Board by Stevens & Associates.

Note: Nasoya Foods has its own listing but Azumaya does not. Azumaya is listed under Vitasoy USA Inc. as a brand. Address: Stevens & Associates, 4816 North Pennsylvania Street, Indianapolis, Indiana 46205. Phone: 317-926-6272.

1609. Liu, KeShun. 1998. Re: Profile. Letter to William Shurtleff at Soyfoods Center, March 18. 2 p.

• **Summary:** This profile is an autobiography of Dr. Liu. Soyfoods Center has divided the story into two parts. Most of it is told in our “About the author” section at Dr. Liu’s excellent 1997 book titled *Soybeans: Chemistry, Technology, and Utilization*. The rest, which follows, is a description of his major responsibilities as Project Leader of the Soyfoods Laboratory at Hartz Seed in Stuttgart, Arkansas, where he works on breedings soybeans for food use. He oversees the laboratory and “collaborates with several plant breeders within Hartz Seed and scientists at Monsanto’s Life Sciences Research Center, St. Louis [Missouri], to improve soybean quality for making both Oriental soyfoods and Western soy products (including soy oil and soy protein ingredients). His major responsibilities include: (1) conducting research on the factors that affect the quality of soyfoods (such as soymilk, tofu, natto & soy sprouts) and soy protein ingredients, (2) identifying relationships between raw soybean components and the quality and yields of soyfoods, (3) developing reliable laboratory methods for making soyfoods and evaluating their quality attributes, (4) developing rapid methods for screening chemical components of breeding lines (e.g. assay for fatty acid composition), (5) researching the nutritional and functional properties of soybean oil and

exploring applications of modified soybean oil obtained through plant breeding, (6) and identifying new product concepts and areas for further improvements of soybeans as food.” Address: Project Leader, Soyfoods Lab., Hartz Seed—A Unit of Monsanto Co., Inc., 901 N. Park Ave., Stuttgart, Arkansas 72160. Phone: (870) 673-8565.

1610. Thompson, Keith. 1998. Breeding food-grade soybeans at Hartz Seed Co. (Interview). *SoyaScan Notes*. March 19. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Hartz’s natto breeding program is one of the best models for developing food grade soybeans with what are increasingly called “quality traits.” Frank Orthofer, a scientist with an MBA, is an expert in this field—especially in the area of proteins and oil. Frank used to work for Riceland Foods in Stuttgart, but now he works for Hartz / Monsanto. KeShun Liu was hired to work on tofu and natto. The work with tofu has not progressed well, but the work with natto has. From the Hartz viewpoint, Dr. Liu’s three most important areas of research are breeding soybeans: (1) for natto (which accounts for 30% of Hartz’s revenue), (2) that are high in saturated fat, allowing elimination or reduction of hydrogenation; and (3) that are high in total oil content. Address: Food and Export Manager, Hartz Seed, P.O. Box 946, Stuttgart, Arkansas 72160. Phone: 800-932-7333.

1611. Iderabdullah, Bisi. 1998. History of work with soybeans and soyfoods in Liberia. Part II (Interview). *SoyaScan Notes*. April 6. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** In December 1989 a bloody civil war began in Liberia in the countryside. By July 1990 it had reached Monrovia. Many orphaned and abandoned children were brought to the Mission, so an orphanage and clinic sprang into existence at a house next to their house, on an adjacent compound, and was soon caring for about 30 kids. Bisi and Mahmoud paid all expenses of the orphanage, clinic, and Mission from their personal funds.

Bisi and her family returned to the USA after a cease-fire in late November 1990 and tried to solicit support to help feed the many starving people in Liberia. She called CARE and many other organizations, but with little results. One day someone asked her: “What is the name of your organization?” She had previously lost their fifth child, named Imani, so she said spontaneously “Imani House.” The name stuck. Then she called The Farm—getting the address from Ina Mae’s book. She was told that they had a philanthropic arm named Plenty, but they no longer supplied relief foods. Then she called Peter Schweitzer’s office in California to ask him what they could do to help—the situation was very urgent and the world wasn’t paying much attention. They got to know one another over the phone and Peter said that Plenty would choose Imani House as a

group that they would work with. When they talked about growing soybeans, Bisi thought it was “a little bit way out for Liberia.”

Bisi and Chuck Haren (who had been sent by Plenty) went together to the International Institute of Tropical Agriculture (IITA) in Ibadan, Nigeria. Chuck had already taken their training program, but he wanted to introduce Bisi to it. IITA people showed them how to grow soybeans, gave them soybean varieties especially adapted to West Africa, demonstrated simple machinery for pressing oil from the soybeans, introduced them to the *bumbum* leaves they use with lemon as a coagulant in the lab to make tofu, prepared many different dishes from soybeans, and demonstrated different quick and simple ways of making soymilk for use as a beverage. They spent a lot of time with Dr. Sidi Osho, an expert in soybean utilization. Bisi and Chuck were given a tour of local businesses producing soyfoods, including one that made Soyvita soymilk in Lagos. One chemist had turned his distillery into a soymilk factory. In the market, they saw soybeans being fermented to make dawa-dawa, a seasoning. After seeing all these things at IITA, Bisi’s skepticism about the potential of soyfoods in Liberia was largely overcome. She and Chuck returned to Liberia.

Returning to Liberia, Bisi and Mahmoud changed the name of their African Islamic Mission to “Imani House;” they didn’t want to be killed because they were Muslims—which happened a lot in Liberia during the war. Their original mission, to teach agriculture and education, remained unchanged.

Originally Bisi had assumed that the agricultural work of Imani House would have to be done in the countryside, outside of Monrovia. But by 1990 she realized that urban agriculture was a real possibility.

Bisi and Chuck first planted soybeans in Liberia in about 1991. The seed came from two sources: They brought back about 6 kg of specially adapted seed from IITA, and the rest they bought in a local market in Liberia; the latter soybeans had come in to Liberia as a relief food and the people were rejecting them (they took too long to cook; the local people thought they were split peas), so they were selling at a very low price. They supervised the planting of these soybeans at 8 different sites, in small plots totaling about 1 acre, in and around Monrovia—no further than 25 miles away. The United Nations provided an agronomist (Mr. Sha of UNDP), who planted some of the seeds incorrectly; they were viable and they germinated. Imani House had 5 acres of land on which they planted one small plot. None of the 8 plots grew well. The war was going on and people grew the soybeans on poor soil that they would not ordinarily use. The plots did not yield enough soybeans to eat, but they did yield enough seeds to replant. The seeds from IITA did the best, but they never gave good yields. The bean beetle became the biggest plague, eating through the leaves. Bisi used compost and many organic methods. The farmers wanted to spray a lot

and use chemical fertilizers. In about 1994 they had a very good yield one year at one site in a back-yard garden on virgin soil. The soybean plants were lush and the beans were large. There were big problems with seed storage, since there were heavy rains 6 months of the year.

Throughout this time, Bisi was doing trials with utilization. They would take a few pounds of soybeans to an orphanage and teach them how to make and use soymilk and okara fritters (seasoned patties of okara mixed with flour then, fried). “They loved these foods.” They had a big demonstration for home economists from the Ministry of Agriculture, who work with the school feeding program. They developed a sheet of nutritional information on soybeans and soymilk (comparing soymilk with cow’s milk) which they passed out to these nutritionists.

From September to December 1995, with help from the Trull Foundation of Texas, Plenty was able to send a soy/ agricultural technician from Belize to Liberia to help Imani House with its soybean project. His name was Ignatius (“Gomier”) Longville. A Caribbean native and a Rastafarian (Rasta = “Roots”) farmer, he was skilled in ways of growing food under adverse conditions using the natural rhythms and resources. He had worked with Plenty on the island of St. Lucia from 1984 to 1990. Now he volunteered his services, providing hands-on assistance to help Imani House and the farming groups with which they were working in Liberia to grow soybeans and other crops in nutrient-deficient soils. He introduced organic methods of pest management and demonstrated composting techniques. They used a Rototiller to open the soil and control the bean beetle, and added small amounts of chemical fertilizers. The result was the most successful crop of soybeans ever. The Liberian farmers were impressed.

In October 1995 Imani House won first prize for food processing at a World Food Day Exposition in Monrovia. Gomier and the Imani House staff conducted soyfood demonstrations for 10,000 people. “We couldn’t make food fast enough. We made pies, soymilk (mixed with cocoa), soy fritters, soynuts, and tofu on site. We just didn’t have enough. It was amazing.” They had plenty of soybeans (300-400 lb), which they bought from Ghana, with help from the Ghanaian Ministry of Agriculture.

Building on these successes, Bisi got FAO to agree to bring in a container of soybeans for planting and to provide a consultant (Delvin Walker) to help Imani House. Walker was an agronomist; before the war he had been a teacher of agriculture at Cuttington University, the Christian university in Liberia. Walker was already a member of the Imani House board of directors; he went with Bisi to talk with FAO and WFP (the World Food Program). They also got the World Food Program to agree to bring in soybeans for utilization. The Liberian government had agreed to give Imani House a memorandum of understanding that they would be the soybean growers and demonstrators in Liberia. The head

of the Ministry of Agriculture believed that this agreement would help Imani House to get the funding that they needed so much. Work was underway using soybeans and cassavas to make an enriched *gari*.

Then in April 1996 factional fighting flared up again, devastating Monrovia. The civil war was on again. Bisi, too was devastated—just as her soybean program was finally about to take off. “Armed robbers took our Rototiller, all of our farming equipment. We lost everything. We left Liberia and stayed in Senegal for four months, waiting to go back. But it never got better.” Then they went to Gambia. In English-speaking Gambia they were invited by a leading citizen to stay and work to introduce soybeans.

The civil war is now officially over, and Bisi is working to raise funds in the USA which are used to support her Liberian program. She is also trying to raise funds for the soybean, agricultural, and literacy programs. The clinic has been rebuilt and literacy programs have been re-started in English and Bassa. Benjamin Grant is administering the programs. The war has cooled down but anyone who buys equipment is at risk of visits from armed robbers. Because she is now in New York, Bisi is also developing Imani House’s local program. She hopes eventually to return to Liberia. “The problem now is not to import soybean to Liberia but to grow it. We see it as a way of solving major problems of malnutrition in Liberia.” Address: Director, Imani House, 76A Fifth Ave., Brooklyn, New York 11217. Phone: (718) 638-2059.

1612. Muramatsu, Kanako; Yamawake, Norio; Kiuchi, Kan. 1998. *Bacillus subtilis* (natto) KFP 419 ni yoru erasutaze no seisan [Production of elastase by *Bacillus subtilis* (natto) KFP 419]. *Nippon Shokuhin Kagaku Kogaku Kaishi* (*J. of the Japanese Society for Food Science and Technology*) 45(8):494-98. [24 ref. Jap; eng]

• **Summary:** “Production of elastase by *Bacillus subtilis* (natto) KFP 419 was investigated to obtain enough enzyme for studying on physiological functionality of itohiki-natto... The maximum elastase activity was obtained at pH 7.0 after 24 hour fermentation” (from journal@rchive). Address: Kyoritsu Women’s Univ., 2-2-1 Hitotsubashi, Chiyoda-ku, Tokyo 101, Japan.

1613. Tamang, J.P. 1998. Role of microorganisms in traditional fermented foods. *Indian Food Industry (Mysore, India)* 17(3):162-67. May/June. [32 ref]

• **Summary:** This article is mainly about the benefits of fermentation and fermented foods. Contents: Introduction (main microorganisms are filamentous fungi, yeasts and bacteria, especially LAB = lactic acid bacteria). Biopreservation. Bioenrichment. Microorganisms that produce enzymes. Microorganisms that destroy undesirable components. Enrichment of the diet. Mixed starter culture. Traditional fermented foods of medicinal value (koumiss,

kvass). Conclusion.

The following fermented soyfoods are mentioned: Kinema, hawaijar, miso, natto, shoyu, tauco, and tempe [tempeh]. Koji is also mentioned.

“Fermented foods are defined as foods that have been subjected to the action of selected microorganisms by which a biochemically and organoleptically modified substrate is produced, resulting in an acceptable product for human consumption.” Address: Microbiology Research Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim-737 102, India.

1614. Muramatsu, Kanako; Yamawake, Noriko; Kiuchi, Kan. 1998. *Bacillus subtilis* (natto) KFP 419 ni yoru erasutaze no seisan [Production of elastase by *Bacillus subtilis* (natto) KFP 419]. *Nippon Shokuhin Kagaku Kogaku Kaishi* (*J. of the Japanese Society for Food Science and Technology*) 45(8):494-98. [24 ref. Jap; eng] Address: Kyoritsu Women's Univ., Japan.

1615. Goldbeck, Nikki; Goldbeck, David. 1998. *The healthiest diet in the world: A cookbook and mentor*. New York, NY: Dutton (Penguin/Putnam Inc.). xiii + 561 p. Sept. Illust. General index. Recipe index. 25 cm. [840+\* ref] • **Summary:** This is an excellent book, with a wonderful title that lives up to its promise. Both authors are real professionals, with 25 years in the field. Contains extensive information about the importance of a wholefoods, natural foods diet, with plenty of fresh fruits, vegetables, beans, and soyfoods as sources of the many recently-discovered phytochemicals, which offer promising health benefits. The authors are fans of soyfoods, which are featured in both the text and recipes throughout the book.

In Part I, “Goldbeck’s Golden Guidelines,” No. 5 is “Super Soy Foods” (p. 14-15) which encourages readers to “Make soy foods a regular part of your diet.”

Part II is the recipe section, titled “In Nikki’s kitchen: Healthiest diet recipes.” The main soyfoods used in recipes are tofu (48 recipes!), tempeh (15), soy milk (14), miso (8), soybeans, whole dry (3), and soy flour (2). This book contains so many soy-related recipes that we cannot possibly list all of their names. So here are two samplers of such recipes to give a feeling of their diversity, extent, and inviting names. (1) Salad dressings and salads: Creamy miso-mustard coleslaw (p. 178). Tofu mayonnaise (p. 190). Creamy tofu Russian dressing (p. 191). Creamy tofu ranch dressing (p. 191). Lemon-tahini dressing (with soy sauce, p. 192). Creamy miso-mustard dressing (p. 193).

(2) Tempeh recipes: Tempeh strips (p. 31). Tempeh breakfast links (p. 32). Baked Italian tempeh (p. 38). Tempeh burgers (p. 39). Skewered tempeh with orange-nut crust (mini kebabs, p. 61). Maple-pecan tempeh (p. 98). Baked corn-tempeh hash (p. 98-99). Picadillo (Latin American sloppy Joes with tempeh, p. 99). Tempeh mushroom stew (p.

100). Asian grill (with marinated tempeh, p. 101). Tempeh kebabs (p. 102). Shish kebab in a bag (p. 103). Tempeh-bean chili (p. 114-15).

In Part III, “Mentor,” one entire chapter is dedicated to soyfoods (“5. In praise of soybeans,” p. 408-29). The contents of that chapter: Introduction. Soy’s special assets. The phytochemical furor. Protein plus. Soy fiber. Vitamins and minerals. Soy concerns. Soy food selection (incl. Western-style dairy and meat alternatives; soy cheese, soy ice cream, “soy-based imitation meat”). Stick with traditional soy foods: Tofu, tempeh, soy milk, soy nuts, whole soybeans (incl. edamame or green soybeans), soy sprouts, soy flour, soy grits, soy sauce, miso, okara (soy fiber), natto. Soy for health: Introduction, cancer (breast, prostate, and other hormonally influenced cancers), heart disease, diabetes, osteoporosis, women and soy, infant feeding. Nikki’s dialog boxes: Mixing and matching soy protein. Just because they call it “milk”: Nondairy vs. dairy. The question of salt. How to acquire your anti-cancer soy intake. Twenty-five grams of soy protein a day?

Soybeans are also mentioned in Chapter 6, “The beauty of beans” (see p. 431, 434). The 43-page bibliography of current scientific information on the health benefits of foods is worth the price of the book.

In the chapter titled “Controversial carbohydrates” is a long section about the glycemic index of foods titled “G-Force: A new perspective on carbohydrates” (p. 280-89); it includes a 6-page table showing G-force [glycemic index] ratings for individual foods. “Foods with a high G-Force [55 and above, bad] raise blood sugar levels quickly; this is usually matched by a rapid rise in insulin. Foods with low G-Force cause blood sugar levels to rise gradually, in which case insulin is usually released more evenly.” Foods that tend to have a high G-Force are: Desserts and sweets (doughnut 108, graham crackers 106), foods made from refined flours (baguette 136, bagel 103, white wheat bread 100), sweet and refined breakfast cereals (puffed rice 132, Cornflakes 119, Cheerios 106), sugars (maltose 150, glucose 137, sucrose 92). Foods groups that tend to have low G-force are: Fruits (apple 54, apple juice 58, orange juice 63, but watermelon 103), legumes (soybeans 25, chickpeas 47), dairy products (yogurt 20, milk 46). vegetables (non-starchy). Address: Woodstock, New York.

1616. Wannamaker, Luther B.; Wannamaker, Mary Joe. 1998. Memories of John E. Wannamaker, soybean developer and farmer from South Carolina (Interview). *SoyaScan Notes*. Oct. 15. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** John E. Wannamaker (pronounced WAN-uh-may-kur) was a minor seedsman and farmer from St. Matthews, South Carolina. He had a deep, lifelong interest in the soybean, and is best known for developing the soybean varieties named J.E.W., after his initials. John was a very

far-sighted man, especially when it came to the potential and future of soybeans.

Luther's father and John Wannamaker were cousins. Mary Joe, who has a PhD degree, is Luther's daughter. Luther knew John Wannamaker quite well.

John had a nephew who died about 3 years ago. He lived as a hermit at the end of the woods. When his will was probated, it was discovered to everyone surprise, that he left all of his land to a land trust, that would set it aside for conservation and not develop it. His uncle, John, would have liked that!

Luther returned to the business in 1966 to work with his father. John E. had begun to sell soybean varieties by that time, and Luther continued this practice. Bragg was one of the varieties sold. Unfortunately the family no longer has any seed catalogs from that time period.

Luther grows mostly cottonseed, but for the last ten years he has grown a black soybean (*kuromamé*) variety named Tamba, as a specialty crop. It has a higher sugar content than most soybeans. He ships most of his black soybeans (mature/dry) to Japan, where they are boiled with sugar and served on New Year's Day (January 1). Now that the Japanese have discontinued their old rice-growing quotas, they are growing more soybeans in Japan. These compete with Luther's black soybeans, so he would like to try to sell his black soybeans to Asian Americans—especially on the West Coast.

This year, for the first time, Luther is growing (experimentally) a black natto soybean. The Japanese think that black means sweet. He is also considering harvesting his Tamba at the green vegetable stage (the seed is still green) to sell as edamamé. He thinks they would grow well since his latitude is similar to that where edamamé are grown in Japan. Moreover, he has a patented soybean picking machine. However he does not have a freezer or a cooker. Address: L.B. Wannamaker Seed Co., P.O. Box 497, St. Matthews, South Carolina, 29135. Phone: 803-874-3011.

1617. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 1998. Nattô kin to nattô no ito [*Bacillus subtilis* (natto) and natto's strings]. 45(11):710. [3 ref. Jap]

1618. Sarkar, Prabir K.; Morrison, E.; Tinggi, U.; Somerset, S.M.; Craven, G.S. 1998. B-group vitamin and mineral contents of soybeans during *kinema* production. *J. of the Science of Food and Agriculture (London)* 78(4):498-502. Dec. [24 ref]  
Address: Queensland Health Scientific Services Lab., P.O. Box 594, Archerfield, Brisbane, Queensland 4108, Australia.

1619. Muramatsu, K.; Kanai, Y.; Tanaka, T.; Kiuchi, K. 1998. Comparison of Korean chungkuk-jang with itohiki-natto on development of new fermented soybean food. *Bulletin*

*of the Center for Interdisciplinary Studies, Science Culture Kyoritsu Women's Univ.* 4:22-25. \*

1620. Nout, M.J.R.; Bakshi, D.; Sarkar, P.K. 1998. Microbiological safety of *kinema*, a fermented soyabean food. *Food Control* 9(6):357-62. \*  
Address: 1. Lab. of Food Microbiology, Wageningen University, 6700, EV Wageningen, The Netherlands.

1621. Tamang, Jyoti P. 1998. Indigenous fermented foods of Sikkim Himalaya: Socio-economical perspective. In: Suresh C. Rai, Rakesh C. Sundriyal, and Eklabaya Sharma, eds. 1998. *Sikkim: Perspectives for Planning and Development*. Sikkim, India: Sikkim Science Society; Dehra Dun, India: Bishen Singh Mahendra Pal Singh. xix + 716 p. See p. 513-22. [20+ ref]\*

• **Summary:** Includes a discussion of *kinema*, a fermented food made from soybeans. Address: Dep. of Botany, Univ. of North Bengal, NBU 734430, District of Darjeeling, West Bengal, India.

1622. Baba, Teiji. 1998. *Jibun de tsukutte nattô ku: zukai* [Eat the natto you have made yourself: Illustrated]. Tokyo: Hato Shuppan. 123 p. 21 cm. Series: Omoshiro Sensho, no. 19. [Jap]\*

1623. Keuneke, Robin. 1998. *Total breast health: The power food solution for protection and wellness*. New York: Kensington Publishing Corp. xxviii + 416 p. Foreword by Lendon Smith, M.D. Index. 24 cm. [200+\* ref]

• **Summary:** The key to total breast health (and preventing breast cancer) is a healthy traditional diet and lifestyle. Chapter 7, "Soybeans protect against breast cancer," has this contents: Two pro-soy quotations. Introduction. Some phytochemicals in soy and their properties. Phytic acid. Other benefits of soy for women: Osteoporosis, symptoms of menopause, symptoms of PMS, heart disease, anti-aging benefits, gallstones. Update on the politics of soybeans: Will quality be sacrificed for commercial purposes? Fermented soy foods are especially beneficial. The magic of miso: Folklore was right. The National Cancer Institute is spreading the word about soy's ability to protect against breast (and prostate) cancer. Phytochemicals in soy: (1) Inhibit the growth of tumor cells. (2) Convert cancer cells back into normal cells. (3) Block the entry of estrogen into breast cells; this is beneficial in preventing cancer. "Research shows that soy isoflavones may protect against high levels of synthetic estrogen in the diet." Soy foods include: tofu, tempeh, miso, edamame, soy sauce, soymilk, natto (fermented soybeans), soybeans and second-generation soy foods such as cheese, textured vegetable protein, and meat alternatives such as soy breakfast links.

Contains over 125 internationally inspired recipes, incl. Tofu Cote D'Azur, and Dilled Salmon in Miso-Lemon

Sauce.

A portrait photo of Robin (a woman) appears on the inside rear dust jacket. The last page of the book (unnumbered) is "About the author." Address: Norwalk, Connecticut.

1624. Obatolu, V.A.; Osho, S.M.; Uwaegbute, A.C. 1998. Comparative physicochemical properties of fermented soybean and locust bean. In: Ferris, R.S.B., ed. 1998. *Postharvest Technology and Commodity Marketing in West Africa. Proceedings of a Conference...* [vi] + 300 p. See p. 163-68. Held 27 Nov.-1 Dec. 1995 at Accra, Ghana. [14 ref]\*  
 • **Summary:** Soybean is a practical alternative to locust bean in the production of dawadawa; the traditional product is becoming increasingly scarce and expensive. Address: 1. Inst. of Agricultural Research and Technology, IITA / IDRC Soybean Project, Ibadan, Nigeria.

1625. Solomon, Charmaine; Solomon, Nina. 1998. Charmaine Solomon's encyclopedia of Asian food. Boston, Massachusetts: Periplus Editions. xiv + 480 p. Color illust. ([28] p. of plates). 29 cm. [67\* ref]  
 • **Summary:** An outstanding book; the color illustrations of many ingredients are spectacular and very informative. The author has an insatiable curiosity.

Contents: List of illustrations. Introduction. How to use the *Encyclopedia of Asian Food*. Acknowledgements. A-Z of Asian Food. Bibliography. Illustrated index of selective ingredients. Index of recipes. Index of alternative words and main entries.

Soy related entries: Bean curd (p. 26-28, incl. all the different types, yuba, deep-fried tofu types, fermented tofu incl. ch'ou doufu [chou doufu]: "Despite its overpowering aroma, slimy texture, unappetizing color and the unfortunate odor it leaves on the breath, those brave enough to partake of it consider it a delicacy").

Bean paste, sweet (p. 29. The three colors and types are red {from adzuki beans}, yellow {from mung beans, husked and split}, or black {from black soy beans}. "The pastes are usually available ready-made sweetened in cans. It is possible to make your own, starting out with dried beans." Name in Chinese: dow sa, tau sa {sweet bean paste}).

Bean paste, yellow (p. 29. Despite what the label says, this thick, salty condiment is brown, not yellow, in color).

Bean sauces (p. 29. "Made from fermented soy beans," they range in color from yellow to brown to black [sweet black bean paste]. Their consistency is more like a paste that must be spooned from the jar than pourable tomato ketchup).

Beans, salted yellow (p. 31. Canned yellow soybeans which have been salted and fermented).

Beef (p. 31-37 incl. Teriyaki steak, Sukiyaki, Beef with black bean sauce, incl. "2 tablespoons canned salted black beans [fermented black soybeans]").

Black bean (p. 43-44. Black soy beans which are

fermented and salted. "Some are sold in cans in a salty liquid, others in plastic bags, covered with salt crystals." Also called "preserved black beans").

Flours & starches (p. 157-61). Incl. soy flour, which is "used mostly in Japan [where it is called kinako] and China. In Korea roasted soy bean flour and fermented soy bean flour are used to make a variety of bean pastes."

Legumes & pulses (p. 206-18). A long and interesting section. All entries have a scientific name. Many have an illustration. Those found in many Asian countries (e.g., green bean, green pea) have the name in each country. Includes: Introduction, adzuki bean, asparagus bean (see winged bean), asparagus pea, black-eyed pea (a variety of cowpea), black gram, blue pea, broad bean, butter bean (see lima bean), chick pea, cowpea (see yard-long bean), fenugreek, green bean, green pea, hyacinth bean (see lablab bean), lablab bean, lentil, lima bean, long bean (see yard-long bean), moong bean (see mung bean), moth bean, mung bean, parkia, peanut, pigeon pea, red bean (see adzuki bean), red kidney bean, rice bean, sataw bean (see parkia), snow pea, soy bean (short entry), sugar snap pea, tamarind, white gram (see black gram), winged bean (China: su-ling dou; India: Goa bean; Indonesia: kecipir; Japan: shikakumame; Malaysia: kacang botor; Philippines: sigarilyas; Sri Lanka: dara-dhambala. Thailand: thua pu). Yard-long bean (this is the fresh bean known by a host of names). Recipes: Adzuki bean soup.

Master sauce (p. 232). "Also known as 'flavour pot' or 'lu,' this sauce has a base of soy sauce, water, sugar and Chinese wine or sherry, with a few variable additions..." Cooking with it is similar to 'red-cooking.'

Miso (see soy bean products). Mushrooms & fungi (p. 237-40, incl. recipe for Braised bean curd, cloud ear and vegetables, and Braised soy mushrooms). Natto (see soy bean products).

Oils (p. 258-59, incl. coconut oil, gingelly oil [sesame oil], mustard oil, palm oil, palm kernel oil, peanut oil, perilla oil, sesame oil). Note: Soy oil is not mentioned here! Okara (see soy bean products). Salads, incl. recipe for Indonesian vegetable salad (gado-gado), that calls for 4 oz. fried bean curd. Shoyu (see soy sauce).

Soy bean, dried (349). China: da dau, wong dau, hak dau, tai dau. Indonesia: kacang kedelai. Japan: daizu. Korea: jaa jang. Malaysia: kedelai. Philippines: utaw. Thailand: thua lueang.

Soy bean, fresh. China: mao dau. Indonesia: kacang soja. Japan: edamame. Malaysia: kacang soja. Recipe: Fresh soy beans with bean curd.

Soy bean products (p. 350): Miso (incl. recipe for miso soup). Natto. Soy bean paste (go). Soy milk. Tahuri (Philippine fermented tofu). Tokwa (tokwan; very firm square tofu).

Soy bean sprouts, with recipe for soy bean sprout salad. China: dai dau nga choi. India: bhat. Indonesia: kacang

kedele, taueh. Japan: daizu no moyashi. Korea: Kong namul. Malaysia: kacang soja, taueh. Philippines: utaw. Thailand: thua-lueang.

Soy sauce (p. 351-52). Chinese soy sauce: Dark soy sauce. Light soy sauce (“Usually labeled ‘superior soy’”). Mushroom soy sauce (Dark soy sauce that has been flavored with straw mushrooms). Japanese soy sauces: Koikuchi (regular shoyu), tamari, usukuchi. Korean soy sauce (“About the same colour as Chinese light soy sauce, but not as fiercely salty and with a sweet malted aroma”). Thick and flavoured soy sauces: Kecap asin (“A dark, salty soy sauce, from Indonesia, a little thicker than the dark soy of China”). Kecap manis (A thick, sweet soy sauce from Java, Indonesia). Kicap cair: “The Malaysian equivalent of light soy sauce.” Kicap pekat: “The Malaysian equivalent of dark soy sauce, though thicker than the Chinese version, but not as thick as kecap manis.” Ponzu shoyu. Toyo mansi (p. 352): “A soy sauce used in the Philippines soured with kalamansi juice.”

Tempeh (p. 386). Incl. recipes for Savoury Tempeh and Thai style tempeh. Tofu (see bean curd).

Also discusses: Adzuki bean, agar-agar (incl. almond bean curd, awayuki), almond, amaranth, cowpea, crab in black bean sauce (recipe at crab), daikon, millet, monosodium glutamate (“I would strongly recommend omitting it”), Nonya (pronounced ‘Nyonya.’ The unique cookery found in Malaysia and Singapore resulting from the fusion of Malay and Chinese cuisine during the last century), peanut, peanut sauce, sago (this palm flowers only once in its life, at about age 15. Just before flowering, it builds up a large reserve of starch in the pith. The tree is felled, the pith scooped out, ground and washed to make sago starch), seaweed (incl. agar-agar, hijiki, kombu / konbu, mozuku, nori / laver, wakame), sesame paste, sesame seed, vegetarian meals (“By far the most important vegetarian food in the Far East... is bean curd”). Address: Australia.

1626. Tamang, J.P.; Nikkuni, Sayuki. 1998. Effect of temperatures during pure culture fermentation of kinema. *World J. of Microbiology and Biotechnology* 14(6):847-50. [13 ref]

• **Summary:** Using a pure culture starter, whole cooked soybeans were fermented at 35°C, 40°C, and 45°C for 24 hours. Key variables were recorded. At higher temperatures the bacteria grew more rapidly. “A remarkable increase in the relative viscosity of kinema was observed at 40°C...” Moreover, kinema matured at below 10°C for one day after the desired fermentation showed an additional significant increase in viscosity. The quality of kinema was maintained by pure culture fermentation using a select strain of *Bacillus subtilis* at 40°C, for 20 hours, and matured at 5°C for one day. Address: National Food Research Inst., Ministry of Agriculture, Forestry and Fisheries, 2-1-2, Kannondai, Tsukuba, Ibaraki 305 Japan 305. Present address of Tamang:

Microbiology Research Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India. Phone: 091-3592-31503. Fax: 091-3592-22707.

1627. Tamang, Jyoti Prakash; Tamang, Namrata. 1998. Traditional food recipes of the Sikkim Himalayas. Gangtok, Sikkim, India: Sikkim Biodiversity and Eco-tourism Project, GBPIHED. 31 p. [Eng]

• **Summary:** The three main ethnic groups of the Sikkim Himalayas are the Nepalis, the Bhutias, and the Lepchas. Table 1 shows the traditional fermented foods of this area; one of these is kinema. Table 2 shows the traditional non-fermented foods of this area; one of these is *Vatamas ko achar*, a pickled soybean food [seasoning].

Recipes for kinema (p. 6-7) and *Vatamas ko achar* (p. 7) are given. The ingredients for the latter seasoning are: Soybean 200 gm. Ginger paste 1 tablespoon. Chili powder 1 teaspoon. Salt 1 teaspoon. Mustard oil 1 tablespoon. Method: Roast soybean in a pan, then grind. Add all the ingredients to soybean powder and mix well. Keep in a covered jar; it can be kept for several days. Serve with cooked rice / Selroti.

Note: According to a PowerPoint presentation by Dr. Tamang in 2010, *Vatamas ko achar* is consumed in Nepal, Darjeeling, and Sikkim, primarily by Nepalis, who also consume (in this same area) roasted soybeans (called *vatamas*) and boiled whole soybeans (also called *vatamas*). Address: 1. PhD, PDF (Japan); 2. M.Sc., B.Ed. Both: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1628. Watanabe, S. Assignor to Suzuyo Kogyo Co. Ltd. 1998. [Fermentation room with a horizontal flow type of air conditioner. Fermentation room for natto]. *Japanese Patent* No. 0289668. [Jap]\*

1629. Watanabe, S. Assignor to Suzuyo Kogyo Co. Ltd. 1998. [Continuous fermentation system and fermentation room. Applicant]. *Japanese Patent* No. 2760380. [Jap]\*

1630. Wood, Brian J.B. ed. 1998. Microbiology of fermented foods. 2nd ed. 2 vols. London: Blackie Academic & Professional / Thompson Science. An imprint of Chapman & Hall. [300+ ref]

• **Summary:** Soybeans are discussed extensively. In Vol. 1, in the chapter titled “Fermented protein foods in the Orient: shoyu and miso,” by Yokotsuka and Sasaki (p. 351-416) are detailed and historical discussions of chu (koji), chuang (p. 355), and shi (fermented black soybeans, p. 355-56), chuang-yu (soy sauce, p. 356-57), etc.

In the *Ben-Chao-Gong Mu* [Bencao gangmu, The great pharmacopoeia, 1596] many types of shi are discussed. In more recent times these have apparently been classified into three types depending on the microorganism used in the fermentation: (1) *Aspergillus oryzae* type. (2) *Mucor*

type, usually made in Szechwan. (3) *Bacillus* type. Soak and cook soybeans, then place them in a cloth bag. Cover with straw and ferment for 1-2 days at 25-30°C. “When the beans are covered with viscous substances, Shui-tou-shi is prepared.” Mix the sticky beans with ginger and salt, then pack tightly into jars; age for one week. The product [a sort of salted natto with ginger] is now ready to eat. “The organisms responsible for this fermentation have been identified as *Bacillus* species.” Address: Dep. of Bioscience and Biotechnology, Univ. of Strathclyde, Glasgow, Scotland, UK.

1631. Yonzan, H.; Tamang, J.P. 1998. Consumption pattern of traditional fermented foods in the Sikkim Himalaya. *J. of Hill Research (Sikkim)* 11(1):112-15. [6 ref]

• **Summary:** During 1996-97 a survey was conducted using a questionnaire in 270 randomly selected houses in three hill sub-divisions of the Darjeeling Hills of West Bengal and 315 houses in four districts of Sikkim representing the ethnic communities of the Nepalis, the Bhutia and the Lepcha. The amount of fermented foods consumed at every meal by each person was weighed directly using a portable balance and daily per capita consumption (in gm per day) was estimated. The frequency of eating fermented foods by each family (as a percentage) was also recorded. Annual home production of each fermented food was calculated on the basis of population based on Indian census records. A database was developed from the field data.

For kinema, the average consumption rate in the Darjeeling Hills was 80.6%, whereas it was 78.9% in Sikkim. Kinema was one of three foods that was not eaten daily; it was typically consumed 2-4 times a week as a source of plant protein. The survey showed that, in the Darjeeling Hills, 45.3% of the people prepared the fermented foods at home and only 28.3% purchased them from local markets, while in Sikkim 53.7% of the people prepared the fermented foods at home and only 18.8% purchased them from local markets.

Table 1 shows per capita consumption (gm per day) and annual home production (tons per year) of the various fermented foods. For kinema the figures show: In the Darjeeling Hills, the average per capita consumption was 3.3 gm/day (range 2.3 to 4.7) and the annual production for the entire area was 829 tonnes. In Sikkim, the average per capita consumption was 2.2 gm/day (range 0.7 to 3.7) and the annual production for the entire area was 327 tonnes. Address: Microbiology Research Lab., Dep. of Botany, Sikkim Government College, Tadong (near Gangtok), Sikkim 737 102, India.

1632. Cooper, Kim. 1999. New developments with soybeans in Canada (Interview). *SoyaScan Notes*. Jan. 18. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** The term “food-grade soybeans” is increasingly

widely used by Canadian soybean exporters and their Asian customers to refer to all soybeans developed specifically for food use. Many are large seeded, but some are also small seeded—developed for sprouting (to have high germination) or natto. All have a white hilum. The biggest problem with this term is that all soybeans can be used for human food. About 5-10% of the soybeans exported from Canada are “food-grade.”

Most overseas buyers of Canadian food-grade soybeans want them to be GMO-free. In addition, some overseas crushers now also want soybeans that are GMO-free, though they need not be food grade.

The genetically engineered soybeans grown in Canada are generally handled in two different ways. The great majority, which are used by Canada’s two major soybean crushers (owned by the American companies ADM and Central Soya) are given no special treatment; they are simply sold by farmers to their local elevator, where they get mixed with other soybeans in “the stream.” These two crushers have made it very clear that they do not want these GMO soybeans to be segregated or given any special treatment. However the genetically engineered soybeans purchased by soybean exporters are handled like any other identity preserved (IP) crop, primarily so that buyers in foreign countries who want GMO-free can be guaranteed what they want. For the past ten years, the Canadian soybean trade has been developing its system of IP varieties, especially to serve Japanese customers—who usually like specific varieties. Exporters would contract with farmers to grow these special varieties, then at harvest they would be stored in their own elevator, silo, tank, etc. and shipped with their identity preserved. Organically grown soybeans are handled in a quite similar way. So when GMO soybeans arrived, the export trade decided to handle them just like IP varieties—actually more like organic soybeans than like IP. Setting up such an IP system has that added benefit that if and when, in the future, consumer benefits are genetically engineered into soybeans, their identity will have to be preserved. An increasing percentage of the soybeans grown in Canada are grown under contract—perhaps about 10% at present.

Shurtleff notes: The U.S. soybean distribution system is based on bulk shipments; its ability to handle IP shipments is much less advanced than the Canadian system. For this reason, the U.S. exports of soybeans to Europe have decreased dramatically over the past year. In America, GMO soybeans simply took over the main soybean distribution system; they did so with hardly any discussion and probably based on the assumption that hardly anyone would care. It is the latter assumption that is highly questionable.

Kim: U.S. soybean exporters went to Europe several years ago and told their customers: “We have these genetically modified soybeans and we’re going to be shipping them to you starting this fall.” The European buyers explained that European consumers are different



from American consumers, and may want to think about and discuss this new matter. The American's said, "Sorry, we can't wait. The soybeans are coming." The Europeans felt upset, like the Americans were trying to shove something down their throats.

In Canada, the problem is far from resolved. Consumers in Canada are starting to become aware of this issue, and they are just starting to sound the alarm. But more and more genetically modified products are coming onto store shelves, so Kim believes consumers will gradually develop confidence in them—but not in the next 1-2 years. Kim believes that there is essentially no chance that most consumers will reject genetically modified foods in the long run.

The international conference in Canada last September was attended by about 200 people; there would have been more but for an airline strike in Canada. Peter Golbitz presented an excellent keynote address. His paper and some others are posted on the OSGMB website. Address: Marketing Specialist, OSGMB, Chatham, Ontario, Canada N7M 5L8. Phone: (519) 352-7730.

1633. Jones, Catherine. 1999. Shining examples: At East, the sushi sparkles. If only the service and everything else did. *New York Times*. Feb. 28. p. NJ14.

• **Summary:** This is a review of East Japanese Restaurant (1405 Teaneck Rd., Teaneck, New Jersey—a suburb of the New York metropolitan area, just west of Manhattan island, New York City). The mood was relaxing and the sushi was very good. "Finally the natto roll both surprised and perplexed my group. I love soybeans but have never tried them mixed with scallion in a roll; they are gummy, bland, salty, satisfying and curious all at the same time."

1634. Bernard, Richard L. 1999. Historical list of publicly developed North American specialty soybean cultivars to 1989: Small seeded. Urbana, Illinois. 1 p. Feb. Unpublished typescript.

• **Summary:** This list excludes introductions and privately developed cultivars. For each variety is given: Year released, institute, cultivar name, maturity group, parentage. The varieties listed in this table are Nattawa (Released in 1981, Ottawa, Ontario, Canada), Chico (1983, Minnesota), Canatto (1985, Ottawa), Vance (1986, Virginia), IL1 and IL2 (1989, Illinois), SS201 and SS202 (1989, Iowa), Minnatto (1989, Minnesota), Camp (1989, Virginia), Nattosan (1989, Ottawa), TNS (1989, Ottawa). Address: Prof. of Plant Genetics (Retired), Dep. of Agronomy, Univ. of Illinois, Urbana, IL 61801.

1635. Bernard, Richard L. 1999. Specialty soybean cultivars from 1990 to present: Public institutions, U.S. and Canada. Urbana, Illinois. 2 p. Feb. Unpublished typescript.

• **Summary:** This list excludes introductions and privately

developed cultivars. For each variety is given: Originating organization name and soybean breeder, cultivar name, year released, typical seed size, and parentage. The organizations and named varieties listed in this table are: (1) Agriculture Canada, Ottawa—Cober: AC Pinson, AC Colibri, Micron, AC Colombe (1995-96—small seeded). (2) Virginia Polytechnic and State Univ. (Blacksburg)—Buss: MFS-551 to 591 (1993-97). (3) North Carolina State Univ & USDA—Carter: Pearl (1994g). (4) University of Minnesota—Orf: Black Kato, Toyopro, UM3 (1995-98). (5) North Dakota State Univ.—Helms: Danatto, Norpro (1996-97). (6) Univ. of Nebraska—Graef: Saturn, Mercury, NE2696LS, NE3496SS (1994-96). (7) Ohio State Univ.—S.K. St. Martin & R.J. Fioritto: Ohio FG1, Ohio FG2 (1994). (8) Univ. of Illinois—R. Bernard: KS-2 (1998). (9) Iowa State Univ. and Puerto Rico—Fehr: 45 varieties, all with names such as HP201, IA 1002, or LS201 (1990-98). Fehr is breeding all types of specialty soybeans (see symbols, below).

Symbols: g = general public release; others are exclusive or by license or contract. p = high protein. lx2 = no lipoxygenase-2. lx0 = no lipoxygenase. Address: Prof. of Plant Genetics (Retired), Dep. of Agronomy, Univ. of Illinois, Urbana, IL 61801.

1636. Bernard, Richard L. 1999. Summary of research & breeding programs for food type soybeans. Urbana, Illinois. 3 p. Feb. Unpublished typescript.

• **Summary:** This list excludes introductions and privately developed cultivars. Each entry includes: Originating organization and soybean breeder, food uses (mainly natto and tofu), and breeding objectives. For natto, 100 beans should usually weigh less than 10 gm, whereas for tofu, 100 beans should usually weigh more than 20 gm.

(1) Agriculture Canada, Ottawa—E.R. Cober: Natto and tofu. (2) Agriculture Canada, Harrow—V. Poysa: Natto and tofu. (3) Virginia Polytechnic and State Univ. (Blacksburg)—G.R. Buss: Natto and tofu. (4) North Carolina State Univ.—T. Carter: Natto and tofu. (5) South Carolina State Univ.—E. Shipe: Natto. (6) Georgia State Univ.—R. Boerma & R. Mian: Tofu. (7) Univ. of Minnesota—Orf: Natto and tofu. (8) North Dakota State Univ.—T. Helms: Natto, sprouts, and tofu. (9) Ohio State Univ.—S.K. St. Martin & R.J. Fioritto: Tofu. (10) Univ. of Illinois—R. Bernard: Natto and edamame. (11) Iowa State Univ. and Puerto Rico—W.R. Fehr: Natto, tofu & edamame. (12) Missouri—S. Anand & D. Slepser: Natto and tofu. (13) Univ. of Nebraska—G.L. Graef: Natto, sprouts, tofu, green vegetable [edamame]. (14) Washington State Univ., T. Lumpkin: Edamame.

Small-seeded parents: Camp, Chico, Chohakuzan, Jizuka, Kosuzu, Nattosan, Pearl, Pureunkong, Vance.

Large-seeded parents: Benning, Danbaekong, Enrei, Hyuga, Misuzu Daizu, Nakesennari, Saturn, Shiromeyutaka, Suzuyutaka, Tamahikari, Tanbaguro, Totoshirome.

Edamame parents: Disoy, Magna, Prize, Grande, Vinton

81, Verde, Emerald, LS201, LS301, Saturn. Address: Prof. of Plant Genetics (Retired), Dep. of Agronomy, Univ. of Illinois, Urbana, IL 61801.

1637. Jack, Alex. 1999. Let food be thy medicine: 750 scientific studies, holistic reports, and personal accounts showing the physical, mental, and environmental benefits of whole foods. 3rd ed. Becket, Massachusetts: One Peaceful World Press. 304 p. Index. 23 cm. [8 ref]

• **Summary:** This book, organized alphabetically by subject, is a very original and creative source of information, with hundreds of interesting bibliographic references. The author believes in a natural, whole-foods diet. Includes the following subjects: Alternative medicine, amasake (amazake), Asia Diet Pyramid, azuki beans, bovine growth hormone, cancer, cholesterol, coffee, complex carbohydrates, dairy food, estrogen, evolution, exercise and fitness, fats, fiber, genetically engineered food, genetic model of health and disease, genistein, global warming, heart disease, hiziki, hunza diet, isoflavones, Japanese diet, kombu, kuzu, lignans, longevity, macrobiotics, Mad Cow Disease, meat, menopause, microwave cooking, miso, mochi, natto, nori, osteoporosis, Paleolithic diet, phytochemicals, phytoestrogens, polyps, potatoes, Price–Weston, prostate cancer, protein, rice, Schweitzer–Dr. Albert, sea vegetables, seitan, sesame, shoyu, soy foods, tempeh, tofu, umeboshi plum, vegans, vegetarians, wakame, wartime restricted (diets, incl. World War I and II), whole grains. Resources. About the author. Address: Box 10, Becket, Massachusetts 01223. Phone: (413) 623-5742.

1638. Nagai, Toshirou. 1999. [Breeding and genetic manipulation of *Bacillus subtilis* (natto)]. *Nippon Shokuhin Kagaku Kogaku Kaishi* (*J. of the Japanese Society for Food Science and Technology*) 46(2):39-44. [39 ref. Jap] Address: Genetic Resources Center, National Institute of Agrobiological Resources, Ministry of Agriculture, Forestry and Fisheries, Tsukuba-shi, Ibaraki prefecture 305-8602, Japan.

1639. Stevens & Associates, Inc. ed. and comp. 1999. U.S. 1999 soyfoods directory. Lebanon, Indiana: Indiana Soybean Development Council. 48 p. 28 cm. [23 ref]

• **Summary:** This is the fourth edition of the U.S. Soyfoods Directory. Page 2 states: “And a special thanks goes to the Soy Protein Partnership for sponsoring this project.” For a list of farmers and companies that grow soybeans organically, see p. 28. This 1999 Soyfoods directory is now available online at [www.talksoy.com](http://www.talksoy.com). Address: Stevens & Associates, 4816 North Pennsylvania Street, Indianapolis, Indiana 46205. Phone: 317-926-6272.

1640. Stuttman, Len. 1999. What does the term “food-grade soybeans” really mean? (Interview). *SoyaScan Notes*. March

4. Conducted by William Shurtleff of Soyfoods Center. Followed by a fax of June 19.

• **Summary:** Len uses the term “food-grade soybeans” a lot. He may have learned it from people in Canada. For making soynuts, he needs special varieties of soybeans that are high in protein, low in fat, have good texture, good taste, and retain their integrity during processing (the seedcoat or hull stays on—does not slough off—during the entire soaking, cooking, and deep-frying process). A soybean with a thin seedcoat usually has poor integrity. Actually, he must try to find a variety in which he can get as many of these qualities or specifications as possible at a competitive price. This is complicated; the only way to test a particular variety is to put it through the process. Moreover, a variety (such as Sapphire) that works well one year may not work so well the next year. Or a variety grown at one latitude that works well may not work so well when grown at a much different latitude. Soybeans grown at northern latitudes generally work better than those grown to the south. Not all of Canada’s “food-grade soybeans” work well for Len’s particular application. For example, manufacturers of tofu and soymilk want high protein dispersibility in water. Len wants low protein dispersibility, so that protein is not lost during soaking and cooking.

Thus within this broad category of “food-grade soybeans” each food application has somewhat different requirements. Actually, it gets even more complicated. When most people say “food-grade soybeans” they are usually talking about large-seeded, clear-hilum soybeans—most of which have a Japanese pedigree. Yet makers of natto and soy sprouts want small-seeded soybeans.

Back in the days when public soy varieties predominated, one variety (such as Corsoy) might be around for years and years. But now that most varieties originate from private seed companies, they change more often and they are not generally bred for food use—except in Canada. W.G. Thompson & Sons has a young soybean breeder who is excellent; but they do not have a food laboratory. Address: President and CEO, Sycamore Creek Co., 200 State St., Mason, Michigan 48854. Phone: 517-676-3836.

1641. Kushi Institute. 1999. Kushi Institute store: Food, books, kitchenware, bodycare, video, audio. Spring/summer 1999 (Mail-order catalog). Becket, Massachusetts. 40 p. 28 cm. [8 ref]

• **Summary:** A good new source of macrobiotic supplies. Includes: Amazake (from Kendall Food Co.), arame (sea vegetable), azuki beans (from Hokkaido {Japan} and organic), barley malt, black soybeans (from Hokkaido and USA), dulce, fu (dried wheat gluten), hato mugi [hatomugi], hijiki, kanten flakes, koji, kombu, kuzu, mirin, miso, mochi (organic, Kendall), natto (organic, Kendall), natto miso, nori, rice syrup, sea palm, sea vegetable kit (8 varieties), shoyu, suribachi, tamari, tekka, tofu—dried, tofu kit, umeboshi,

umeboshi concentrate, wakame, yuba. Address: P.O. Box 500, Becket, Massachusetts 01223-0500. Phone: 1-800-645-8744.

1642. Liu, KeShun. 1999. Oriental soyfoods. In: C.Y.W. Ang, K. Liu, and Y-W. Huang, eds. 1999. *Asian Foods: Science & Technology*. Lancaster, Pennsylvania: Technomic Publishing Co., Inc. 546 p. See p. 139-99. Chap. 6. March. [60 ref]

• **Summary:** Contents: Introduction: Soybeans as a crop, composition and nutritional quality of soybeans, soyfoods—from the east to the west, soyfood classification.

Soymilk: Introduction, traditional soymilk, modern soymilk (techniques for reducing beany flavors, commercial methods, formulation and fortification, homogenization, thermal processing, and packaging), concentrated and powdered soymilk, fermented soymilk (with lactic acid bacteria), soymilk composition and standardization.

Tofu: Introduction, methods of tofu preparation, factors involved in tofu making (soybean varieties, concentration of soymilk, heat process of soymilk, types of coagulants, concentration of coagulants, coagulation temperature, coagulation time, process automation, packaging), varieties of tofu (silken tofu, regular and firm tofu, Chinese semidry tofu {*doufu gan*}, Chinese tofu sheets and tofu noodles, lactone tofu), varieties of tofu products (deep-fried tofu, Japanese grilled tofu, frozen tofu, Japanese dried-frozen tofu, Chinese savory tofu, fermented tofu {Sufu or Chinese cheese, varieties of sufu, preparation methods, preparation principle}).

Soymilk film (yuba). Soybean sprouts. Green vegetable soybeans. Other non-fermented soyfoods: Okara, roasted soy powder.

Fermented soy paste (Jiang and miso): Koji, koji starter, and inoculum (koji, koji starter, inoculum), Chinese jiang (traditional household method, pure culture method, enzymatic method), Japanese miso (preparing rice koji, treating soybeans, mixing and mashing, fermenting, pasteurizing and packaging), principles of making jiang or miso.

Soy sauce (Jiangyou or shoyu): Chinese jiangyou (traditional household method, modern methods), Japanese shoyu (treatment of raw materials, koji making, brine fermentation, pressing, refining), principles of making soy sauce, chemical soy sauce (made by acid hydrolysis; heat with 18% hydrochloric acid for 8-12 hours, then neutralize with sodium carbonate and filter to remove insoluble materials), proximate composition of soy sauce, quality attributes and grades.

Japanese natto: Methods of preparation, principles of preparation.

Indonesian tempeh: Traditional method, pilot plant method, principles of tempeh preparation. Fermented black soybeans (Douchi or Hamanatto): Chinese douchi, Japanese Hamanatto.

Tables: (1) Names (English, Chinese, Japanese, Korean, Indonesian, Malay, Filipino) general description, and utilization of nonfermented Oriental soyfoods. (2) Names (English, Chinese, Japanese, Korean, Indonesian, Malay, Filipino) general description, and utilization of fermented Oriental soyfoods. (3) Proximate composition (gm per 100 gm fresh weight) of some fermented soyfoods.

Figures show: (1) Flowchart: Traditional Chinese method for making soymilk and tofu (from whole soybeans). (2) A commercial processing method (Alfa Laval) for making soybase and a subsequent product—soymilk. (3) Photo of homemade firm tofu. (4) Photo of a dish of tofu and mushrooms. (5) Photo of cubes of sufu (Chinese cheese) on a white plate. (6) Flowchart for making sufu from firm tofu. (7) Photo of two packages of dried yuba sticks (Chinese). (8) Photo of a bowl of soy sprouts. (9) Photo of Chinese chiang, and Japanese red and white miso, each on one of three spoons in a shallow white bowl. (10) Flowchart of a common method for making Japanese rice miso [red miso]. (11) Photo of soy sauce in three different containers: dispenser, small bottle, and large Chinese can. (12) Flowchart of a common method for making Japanese koikuchi shoyu (soy sauce). (13) Photo of two chopsticks lifting some Japanese natto from a bowl full of natto; the thin strings connecting the natto above and below are clearly visible. (14) Flowchart of a common method for making Japanese natto from whole soybeans. (15) Photo of tempeh made in the USA in perforated plastic bags (Courtesy of Mr. Seth Tibbott, Turtle Island Foods, Inc., Hood River, Oregon). (16) Flowchart of traditional Indonesian method for making tempeh from whole soybeans. (17) Photo of Chinese *douchi* (fermented black soybeans) on a white plate.

Note: For a biography of KeShun Liu PhD see p. 544. Address: PhD, Soyfoods Lab., Hartz Seed, A Unit of Monsanto, Stuttgart, Arkansas.

1643. Warmuth, Manfred. 1999. Update on vitamin B-12 and tempeh (Interview). *SoyaScan Notes*. April 1. Conducted by William Shurtleff of Soyfoods Center. [1 ref]

• **Summary:** Manfred just talked with Dr. Keith Steinkraus who said he isolated a harmless strain of *Klebsiella pneumoniae* that produced vitamin B-12 in tempeh, and had it tested in a medical laboratory. Then he sent samples to people at The Farm in Summertown, Tennessee, but they never added it to their commercial tempeh starter—for fear that something might go wrong and they would be held responsible and possibly sued.

Manfred found 5-6 recent articles on MEDLINE concerning tempeh and vitamin B-12. Apparently *Bacillus subtilis* [the main bacterium used in the natto fermentation] can also produce vitamin B-12.

Update: Talk with Manfred. 1999. April 10. Manfred just finished experiments using a mixed inoculum (containing approximately equal parts of *Rhizopus*, *Neurospora*, and

*Bacillus subtilis*) to try to make soy tempeh at three different fermentation temperatures (29°C, 34°C, and 41°C). At the lower two temperatures, the tempeh came out very nicely, but at the higher temperature the *Bacillus* predominated. Manfred has not yet measured the vitamin B-12 content of the three types of tempeh. One basic question arises: If such an inoculum is used and grown on tempeh at 32-34°C, will the *Bacillus* eventually mutate so they grow well at the lower temperature and take over the fermentation, ruining the tempeh? For a case study of this type of problem, see the following article, which describes a terrible problem experienced by a tempeh manufacturer in 1982. Shurtleff, William; McBride, G.; Robertson, G.V.J.; Burgeson, T. 1982. "Dealing with tempeh contamination." *Soyfoods*. Winter. p. 29-32. Address: Professor, Computer Sciences, 111 Overlook Dr., Santa Cruz, California 95060. Phone: 831-425-0461 or manfred@cs.ucsc.edu.

1644. Iijima, Akihiko; Sasaki, Hitoshi; Wakamatsu, Hiroyuki; Watanabe, Sugio; Maeda, Yoshimi. 1999. [Microcalorimetric analysis of fermentation of natto, a traditional Japanese food]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 46(5):279-84. [13 ref. Jap; eng] Address: 1-3, 5. Iwaki Meisei Univ., 5-5-1 Chuohdai-iino, Iwaki-shi, Fukushima 970-8551.

1645. Matsumoto, Isao; Akimoto, Takashi; Imai, Seiichi. 1999. [Effect of soybean cooking condition on the quality of natto]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 46(5):338-43. [19 ref. Jap; eng]  
 • **Summary:** Natto was prepared from soybeans cooked under a steam pressure of 1.5 kg per square cm. for various time periods ranging from 1 to 60 minutes, and sensory evaluation, hardness, enzyme activities, components and stringiness of viscous substances of natto samples were investigated. From the results of sensory evaluation of natto samples, it was concluded that the optimum cooking time under this condition was 30-40 minutes. Address: Niigata Food Research Institute, 2-25 Shinei-cho, Kamo-shi, Niigata 959-13, Japan.

1646. Schinner, Miyoko Nishimoto. 1999. Japanese cooking: Contemporary & traditional—Simple, delicious, and vegan. Summertown, Tennessee: Book Publishing Co. 176 p. Illust. Index. 21 cm.  
 • **Summary:** Contents: Introduction (incl. Japanese attitudes towards nutrition, vegetarianism and animal rights, the recipes, the Japanese meal). Sample menus (by season). Glossary: Ingredients, kitchen concepts, and tools. Rice dishes. Soups and stews. Cooking with tofu. Fried dishes. Salads and cold vegetables. Noodles. Meals in a pot. Stewed and braised dishes. Meals in a bowl. Everyday favorites.

Nouvelle Japanese cuisine.

Terms in the Glossary include: Abura-age, agar agar, atsu-age, azuki, fu (made from wheat gluten), goma (sesame seeds), goma-dofu (a tofu-like cake made from sesame butter), hijiki, Inari-zushi (sushi), kanten, konbu, kuzu & kuzu-ko, miso, mochi, natto, nori, okara, sesame oil (goma abura), shoyu, soba, soy sauce, tofu ("Perhaps the most misunderstood food in Japan... Americans might call it bland; the Japanese prefer to think of it as delicate in flavor"), umeboshi, wakame, yaki-dofu, yuba.

This vegan cookbook is filled with many soy-related recipes, both traditional and new. Examples of new: "Fishy Tempura Tempeh. Crispy Fried Tempeh (Kara-Age).

"Trying to dine out in a strictly vegan fashion in Japan can present challenges. Although dairy products are not found in traditional Japanese cuisine, fish-based stocks appear in a range of dishes from appetizers to soups to entrees... My advice to vegan or vegetarian visitors to Japan: find a temple or restaurant that serves traditional *kaiseki*-style *shojin-ryori* (Buddhist vegetarian cooking)—and splurge big time. You won't regret it" (p. 10).

On the rear cover is a biographical sketch of Miyoko. "She was born in Yokohama, Japan, and graduated from St. John's college in Maryland. Her bilingual bicultural background has endowed her with the creativity and originality of the West and the aesthetic sense of the East." She has been a vegetarian since age 12. Address: Owner, Now and Zen Bakery and Vegetarian Restaurant, San Francisco.

1647. Shurtleff, William; Aoyagi, Akiko. 1999. The book of tofu. 2nd ed. Revised. Berkeley, California: Ten Speed Press. 336 p. May. Illust. by Akiko Aoyagi Shurtleff. Index. 28 cm. [321 ref]

• **Summary:** This edition contains a completely new "Appendix B—Directory of Tofu Makers" (p. 313-316, updated to 1 Aug. 1998). The page "About the Authors" (autobiographical) has been updated, and the original photograph has been replaced with two more recent ones—reflecting the fact that Bill and Akiko separated in Nov. 1993 and their marriage ended in May 1995.

After the first printing in Oct. 1998, the Preface was quite extensively revised (but not updated) to include more about how this book came into being (early dates and names), including the important contributions on Jeffrey and Gretchen Broadbent, and of Nahum and Beverly Stiskin. These Preface changes first appeared in the second printing of May 1999.

On page 336 is "The Best of Vegetarian Cooking from Ten Speed Press" (descriptions of eight cookbooks, with price and ISBN). The inside rear cover has been updated, and now includes current information about SoyaScan, the unique computerized database produced by Soyfoods Center. This database now contains more than 55,000 records from

1100 B.C. to the present, and more than 73% of all records have a summary / abstract averaging 128 words in length. A description of the four different types of records (published documents, commercial soy products, original interviews and overviews, and unpublished archival documents), and the number of each type, is given.

The front and rear covers, title page, table of contents, and the first page of each section have been redesigned to give the book a much more contemporary look. Still contains 500 vegetarian recipes—both Western and Eastern style.

Ten Speed Press gave this book a new ISBN: 1-58009-013-8. Yet despite the many changes described above, the authors preferred not to have this called a “new edition” or “revised edition.” Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 925-283-2991.

1648. Imhoff, Dan; Warshall, Peter. 1999. Soybean of happiness: A 3,000 year history of our most modern oilseed. *Whole Earth (San Rafael, California)* No. 97. Summer. p. 75-79.

• **Summary:** Contents: Introduction. Soy industrialism. The industrial products. Global soy fights. The most recent incarnation: Spliced soy. Contains six illustrations from *The Book of Tofu*, by Shurtleff and Aoyagi. Address: Editor, Whole Earth, California. Phone: 415/256-2800.

1649. Ontario Soybean Growers. 1999. Canadian soybeans (Ad). *Soya & Oilseed Bluebook* 2000. p. 104.

• **Summary:** This one-third page black-and-white ad states: “High quality, food grade soybeans for the production of tofu, miso, natto, soymilk, soy sprouts, soy sauce, tempeh and other soya products. Soybeans for the crush market. Identify preserved (I.P.)—Specialty soybeans. Organic and transitional soybeans. Container—Bag/bulk. Bulk vessel.

“Trusted, reliable, supplier of soybeans to the world for over 25 years.

“For more information or a list of suppliers contact: Canadian Soybean Export Association.” Address: P.O. Box 1199, Chatham, Ontario, Canada N7M 5L8. Phone: 519-352-7730.

1650. Tamura, Yoshiyuki; Takenaka, Tetsuo. 1999. [Antioxidative activity of water soluble extracts from okara fermented with *Bacillus natto* and *Rhizopus oligosporus*]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 46(9):561-69. [23 ref. Jap; eng]

• **Summary:** “Water-soluble materials (WSM) were prepared from okara unfermented (OK) and fermented with *Bacillus natto* (ON) or *Rhizopus oligosporus* (OT). The properties of antioxidative activity, hydrogen peroxide decomposition and iron-binding in WSMs were observed. The contents of phytic acid, saponin A, isoflavones, and amino acids associated with antioxidative activity were also determined...

“The fermentation of okara with *Bacillus natto* resulted in an increase in the yield of WSM and the contents of crude protein and amino acid in ON-WSM, but that with *Rhizopus oligosporus* provided only an increase in the amino acid content” (from journal@rchive). Address: Faculty of Agriculture, Tamagawa Univ., 6-1-1, Tamagawa Gakuen, Machida-shi, Tokyo 194-8610, Japan.

1651. Fallon, Sally; Enig, Mary G. 1999. Nourishing traditions: The cookbook that challenges politically correct nutrition and the diet dictocrats. 2nd ed. Washington, DC: New Trends Publishing Inc. xvi + 668 p. Illust. by Marion Dearth. Subject index. Recipe index. Menu index. 26 cm. [200\* ref]

• **Summary:** Contains over 700 recipes. Contents: Preface. Introduction: Politically correct nutrition, fats, carbohydrates, proteins, milk & milk products, vitamins, minerals, enzymes, salt, spices & additives, beverages, about food allergies and special diets, parting words, guide to food selection (nourishing traditional foods, compromise foods {such as tofu}, newfangled foods {such as soy protein isolates and commercial soy milk}), a word on equipment, kitchen tips & hints, references (188). Mastering the basics. Great beginnings. The main course. A catalog of vegetables. Luncheon and supper foods. Grains & legumes. Snacks and finger foods. Desserts. Beverages. Feeding babies. Tonics and superfoods. Appendixes (A-F). About the authors.

Some of the basic recommendations in this book fly in the face of modern nutritional science: Eat more meat. Eat dairy products made from raw milk; pasteurization harms the milk. The worst fats are *trans* fatty acids, produced by hydrogenation; cholesterol and saturated fats do not cause heart disease. Consume plenty of enzymes. Meat should be eaten raw, rare, or braised in stock. Moreover, the authors propose a conspiracy in which doctors, researchers, nutritionists, and spokesmen of various government agencies are giving bad nutritional advice to the American public (p. 2). The authors wish, sentimentally, for the return of the small American farm. Moreover, they do not examine some the non-dietary issues related to a diet based on meat and dairy products: What is its impact on the environment? How would it affect the ability of the Earth to feed more than 6 billion people? What right do humans have to kill animals?

However the authors also make a number of recommendations that many people would agree with: Eat more natural, traditional, fresh, and unrefined foods instead of refined and processed foods. Avoid sugar and hydrogenated fats. This book is strongly influenced by the observations of Dr. Weston Price, a dentist, whose important book *Nutrition and physical degeneration: A comparison of primitive and modern diets and their effects*, was published in 1939.

Concerning soyfoods, the authors favor the use of small amounts of fermented soyfoods (such as traditionally

fermented soy sauce and miso) but are strongly opposed to the use of non-fermented soyfoods such as tofu and soymilk.

Soy-related recipes and information: Commercial soy formulas are low in saturated fats and devoid of cholesterol (p. 6). Today most of the fats in the American diet are polyunsaturated and derived from vegetable oils such as soy (p. 10). The cheapest oils, such as soy oil, are often hydrogenated; this creates *trans* fatty acids (p. 14-15). Cows lose valuable Activator X when fed high-protein soy-based feeds. Lecithin is found in butter (soy, the main source of lecithin worldwide, is not mentioned). Mother's milk is high in cholesterol because it is essential for growth and development (p. 16-17).

Omega-6 (bad) and omega-3 (good) fatty acids in soybean oil (p. 19). Fermented soy foods contain compounds that resemble vitamin B-12 but they are not absorbed by humans (p. 28). Isolated protein powders made from soy are usually obtained by a high-temperature process that over-denatures the proteins to such an extent that they become essentially useless, while increasing nitrates and other carcinogens. These isolated soy proteins can cause osteoporosis (p. 29).

Beef should not be fed soy meal for protein, but rather animal parts (p. 31). Avoid farm raised fish [aquaculture] that have been fed soy meal (p. 32). Cultured soybean products from Asia, such as natto and miso, are a good source of food enzymes if they are eaten unheated (p. 47). The natural glutamic acid in soy sauce and miso gives these foods their rich, meat-like taste (p. 49). Many processed foods contain MSG or hydrolyzed protein, "especially soy-based concoctions" (p. 50).

Heavily yeasted foods, such as soy sauce and Worcestershire sauce, often exacerbate the symptoms of chronic yeast [candida] infection (p. 56). Beans cause digestive problems because they contain two complex sugars, farrinose [sic, raffinose] and stachyose (p. 60). The macrobiotic diet and soybeans: Use only as fermented products like miso, natto, and tempeh. Problems with tofu, soy milk, and phytoestrogens in soy (p. 62). The sickening effect of soy on ruminants (p. 87). In Japan, a typical meal contains miso, soy sauce, and pickles, all fermented products. In Indonesia, they eat tempeh (p. 94).

Ode to naturally brewed tamari soy sauce and teriyaki sauce (p. 147). Soy products increase the body's need for vitamin B-12 (p. 164). Soy in Chinese history. Miso soup. Tofu in fish stock and soy sauce broth (p. 201). Macrobiotic diets (p. 343). Soy foods block zinc absorption (p. 348). Eat natural salmon; farm-raised salmon are fed inappropriate soy meal (p. 418). Problems with soy flour and modern soy products: phytates, antinutrients, omega-3 fatty acids, disagreeable taste, phytoestrogens, phytic acid, enzyme inhibitors (p. 477, 495).

Soybeans are low in two essential amino acids (p. 496). Textured soy protein contains three antinutrients: Phytic

acid, trypsin inhibitors, and isoflavones (p. 502). Person fed soybean milk as an infant had a spleen filled with ceroid (p. 546). Infants should not be fed soy-based formulas which contain phytic acid and estrogen compounds (p. 599, 603-04).

Note: The first edition was apparently published in 1995 by ProMotion Publishing (San Diego, California). Address: California. Phone: (877) 707-1776.

1652. Kuda, Takashi; Tanaka, Chieko; Yano, Toshihiro. 1999. [Fermentation of autoclaved beans by *Bacillus subtilis* (natto)]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 46(10):669-71. [6 ref. Jap; eng]

• **Summary:** "We investigated the fermentation of six autoclaved (121°C, 20 min) beans—soybeans (yellow and black), kidney beans (*taisho-kintoki* and *uzura-mame*), peas, azuki beans, and lotus seeds by *Bacillus natto* strain TF 1. During the fermentation, colony numbers of TF 1, the sticky material, called *itohiki* in Japan, ammonia and L-glutamic acid increased clearly in soybeans, particularly yellow soybeans. The increase in *itohiki* and ammonia concentration was observed in kidney beans, pea and lotus seeds, but not shown in azuki beans" (from journal@rchive). Address: Ishikawa Agricultural College, 1-308, Suematsu, Nonouchi-machi, Ishikawa 921-8836, Japan.

1653. Sumi, Hiroyuki; Yoshikawa, Misako; Baba, Tomoko; Matsuda, Kiminori; Kubota, Hidefumi. 1999. [Elastase activity in natto, and its relation to nattokinase]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 73(11):1187-90. Nov. [19 ref. Jap; eng] Address: 1. Dep. of Physiological Chemistry, Kurashiki University of Science and the Arts, 2640 Tsurajima-cho, Kurashiki, Okayama prefecture 712-8505, Japan.

1654. Skiff, James. 1999. New Japanese law concerning labeling of foods made with genetically engineered ingredients (Interview). *SoyaScan Notes*. Dec. 22. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Jim is aware of this Japanese law, which was passed in Oct. 1999 but does not take effect until 1 April 2001. Jim Echle, head of the American Soybean Association office in Tokyo, told Jim about the law; Echle is extremely receptive to the needs of his Japanese customers, such as tofu makers. ASA is also getting more involved with issues involving identity preserved (IP) soybeans; they are organizing an IP conference on Jan. 17 in St. Louis, Missouri.

Skiff then faxes Shurtleff a provisional translation of the labeling guidelines, in the form of a 1-page table. The translation was done by ASA-Tokyo and sent to Skiff by Jim Echle. There are three columns: (1) Classification of food: A. Not equivalent to conventional foods with regard

to composition, nutrients, or intended use. B. Equivalent to conventional foods, but modified DNA or protein produced therefrom remains after the manufacturing process. C. Equivalent to conventional foods, but modified DNA or protein produced therefrom is removed or decomposed and no longer exists in the in the final food. (2) Examples of the three types of foods: A. High oleic acid soybean oil. B. Tofu and tofu products, soybean sprouts, natto, soymilk, miso, soybean flour, roasted soybeans, corn, popcorn, potatoes, etc. C. Soy sauce, soybean oil, high fructose corn syrup. (3) Method of labeling: “Soybean (genetically modified),...” Address: US Soy, 2808 Thomason Dr., Mattoon, Illinois 61938. Phone: 217-235-1020.

1655. Sumi, Hiroyuki; Ohosugi, Tadanori. 1999. [Anti-bacterial component dipicolinic acid measured in natto and natto bacilli]. *Nihon Nogeï Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 73(12):1289-91. Dec. [15 ref. Jap; eng]

• **Summary:** “In commercially obtained natto and experimentally-prepared natto preparations, relatively high concentrations of dipicolinic acid,  $20.55 \pm 13.67$  mg/100g natto (0.006-0.048%, wet weight) were detected, using a simple method combined with ion-exchange column and colorimetric assay procedures. These values were less than that of the previous data (0.06-0.20%, wet weight) reported 60 years ago. Dipicolinic acid was thought to be an intracellular component of natto bacilli and could be extracted in the water-soluble fraction by heat-treatment of the sample for 30 min at 120°C. Furthermore, the partially purified material from natto bacilli caused very strong inhibition of the growth of sake yeasts (Kyokai 7 and Kyokai 9 mutant)” (from journal@rchive).

Note: The title of this journal is romanized (on p. 1289) as *Nippon Nogeikagaku Kaishi*. Address: Dep. of Physiological Chemistry, Kurashiki University of Science and the Arts, 2640 Tsurajima-cho, Kurashiki, Okayama prefecture 712-8505, Japan.

1656. Gutierrez, Marie-Laure. 1999. Dynamique de production et de commercialisation de l’Aftin Fon dans la région d’Abomey-Bohicon (Bénin) [The dynamics of production and commercialization of soy dawa-dawa in the region of Abomey-Bohicon (Benin)]. Mémoire ESAT 2/M. Sc. DAT. Montpellier, France. Centre National d’Etudes Agronomiques des Régions Chaudes (CNEARC). [Fre]\*

• **Summary:** The author has observed the increased substitution of soybeans for locust beans in making daddawa in Benin.

Note 1. Gutierrez and Juhé-Beaulaton (2002) also report the increasing price for locust beans in local markets; they found a tripling of their price over a ten-year period in Abomey, in southern Benin.

Note 2. Bohicon is a city in southern Benin in the

conurbation of Abomey.

Note 3. About this thesis—deciphering the abbreviations (thanks to Ms. Hinde Hoummani of Montpellier SupAgro and Martine Liguori of California): *Mémoire* stands for “Masters Dissertation or Thesis. *ESAT* stands for “Etudes Supérieures en Agronomie Tropical,” which can be translated as “Higher Education Study in Tropical Agronomy.” *ESAT* in France was an Engineer Diploma (equivalent of a Masters Degree level). In “*ESAT 2*,” the 2 stands for the 2nd year of the degree. In short: Masters Dissertation in Tropical Agronomy (2nd year). M.Sc. stands (again) for “Masters in Science” thesis. *DAT* stands for “Diplôme d’Agronomie Tropicale” = “Diploma in Tropical Agronomy.” It’s a type of Diploma in France.

The Engineer Diploma *ESAT* and the Diploma *DAT*, were only taught in Montpellier at the CNEARC, today known as the Institut for Higher Education in Tropical Agri-Food Industry and Rural Development (in French: Institut des Régions Chaudes, acronym: IRC) of Montpellier SupAgro.

Prior to 2007, before the merger occurred between the 3 Institutions to become Montpellier SupAgro, IRC was the former CNEARC. Where the student could do several diplomas or Engineer Diplomas of their choice, ending it by presenting it with a Master Dissertation / Thesis, as a final exam to complete the course.

The Institution CNEARC, published the Masters Thesis—like all other Masters Theses from *ESAT* and/or *DAT* students—but not as a book.

1657. Konlani, S.; Lamboni, C.; Améiapoh, Y.; Souza, C de. 1999. Microbiology and biochemical composition of “tonou,” a food condiment from fermented seeds of *Parkia biglobosa* (locust bean) and soybean. *Food Biotechnology* 13(3):217-25. \*

• **Summary:** States that *tonou* [like dawadawa] in Togo is now prepared from soybeans.

Note: This is the earliest English-language document seen (Jan. 2012) that uses the word “tonou” to refer to dawadawa, a close relative of Japanese natto.

1658. Nikkan Keizai Shinbunsha Co. Ltd. (Nikkan Keizai Newspaper Co. Ltd.). 1999. [Output of natto]. *Monthly Statist. Beverages Foods* p. 40-45. [Jap]\* Address: Japan.

1659. Bladholm, Linda. 1999. The Asian grocery store demystified: A food lover’s guide to all the best ingredients. Los Angeles, California: Renaissance Books. 234 p. Foreword by Jonathan Eismann. Illust. Index. 23 x 13 cm. Series: A Take it With You Guide.

• **Summary:** An original, well-researched and well-written book—though some of the terminology (such as “beancurd”) is outdated. Soyfood products include: Beancurd noodles (p.

38). Kinako (p. 47). Soy sauce, mushroom soy sauce, kecap manis (p. 53). Hoisin sauce (p. 54).

Chapter 10, titled “Soybean products” (p. 93-99) includes: Black bean sauce, dried soybeans, tempeh, beancurd (pressed beancurd, deep-fried beancurd, savory grilled beancurd {yaki-tofu}, freeze-dried beancurd [sic] {koyadofu}, bean curd sheets {fu pei, yuba, fu jook; the latter are “rolled-up, long, ruffled, cream-colored sticks of bean curd skin, bent in two”}), fermented beans (preserved black beans {fermented black beans, tau see}, bean sauce, toen-jang, chili/hot bean sauce, fermented beancurd), okara, edamame, soybean sprouts, soy milk.

Note: This is the earliest English-language document seen (March 2009) that uses the word “toen-jang” (or “toen jang”) to refer to Korean-style soybean jang (miso).

Concerning preserved black beans: “Also called salted or fermented black beans or ‘tau see,’ this is made by steaming small black soybeans, then fermenting them with salt and spices. Used in a variety of dishes to add a pleasant rich aroma and salty taste... Crush or mash beans slightly to release more flavor or mix with garlic, fresh ginger, or chilies. Available in small glass jars, cans, and plastic bags. They should feel soft and not be dried out... Look for Pearl River Bridge brand labeled ‘Yang Jiang Preserved Beans’ in a 1-pound yellow canister, and Koon Chun Sauce Factory, Double Parrot, and Zu Miao Trademark brands all in 8-ounce bags.” Note: This is the earliest English-language document seen (Nov. 2011) that uses the term “tau see” to refer to Chinese-style fermented black soybeans (preserved black beans).

Concerning bean sauce: “Varieties of this Asian staple include yellow bean sauce, brown bean sauce, bean paste (tau jeong), or sweet bean condiment. All are made from yellow or black soybeans, fermented with salt and in the sweet Northern Chinese type, with sugar-sweetened crushed yellow [soy] beans. Two forms are found: whole beans in a thick sauce and bean paste, which is mashed, ground or pureed beans. The whole bean type has a rounder flavor and adds texture, while the pastes are very salty and should be used sparingly... The yellow bean paste is tau cheo... Sold in glass jars and cans. Look for Koon Chun Sauce Factory, Kon Yick Wah Kee bean sauce, Amoy, or Yeo’s.

Chapter 18, titled “Japanese food products” (p. 168-81) includes: Tsukemono (pickled in miso), miso paste, shiromiso, akamiso, mamemiso, natto, miso soup, noodle dipping sauce base (memmi), tamari sauce, teriyaki sauce, tonkatsu sauce.

Interesting non-soy products include: Sesame paste (p. 57). Satay sauce (with peanuts), gado-gado-dressing (p. 58). Peanut oil (p. 64). Sesame oil (p. 65). Amaranth (vegetable, p. 72). Winged beans (p. 76). Pickled wheat gluten (p. 108). Sesame seeds, peanuts, roasted peanuts (p. 118). Red/azuki beans, agar-agar (p. 121). Wheat gluten (p. 127). Sesame candy, peanut roll (p. 136). Sesame seed and peanut cookies

(p. 137). Sweet red bean paste (azuki *an*, p. 139). Coix seed (Job’s tears, p. 165). Japanese seaweed and kelp (p. 169-70). Umeboshi (p. 171). Fu (dried wheat gluten cakes), mochi (p. 177). Address: Writer, designer, illustrator and photographer, Miami Beach, Florida.

1660. Davidson, Alan. 1999. *The Oxford companion to food*. New York, NY and Oxford, England: Oxford University Press. xviii + 892 p. Illust. by Soun Vannithone. Index. 29 cm. [1500+\* ref]

• **Summary:** The 2,650 alphabetical entries in this excellent encyclopedia and cornucopia represent 20 years of Davidson’s work. The 175 illustrations by Laotian artist Soun Vannithone are superb. There are 39 longer entries about staple foods such as rice, noodles, and apples. A comprehensive bibliography provides access to further information. The book does not contain recipes.

Soy-related entries include: Bean sprouts (p. 64). Black beans, fermented (*chi*, p. 79). Kecap (Indonesian soy sauce, made “basically from soya beans and palm sugar only.” “The word ‘kecap’ has passed into the English language as catchup or catsup and then as Ketchup, which now means something quite different.” p. 429). Ketchup (“probably via the Malay word *kechap*, now spelled *kecap*, which means soy sauce. The word was brought back to Europe by Dutch traders who also brought the oriental sauce itself. The sauce has changed far more than has the word, although the name has appeared in a large number of variations such as catchup and catsup.” Discusses tomato ketchup, mushroom ketchup, and ketchup made from oysters, mussels, walnuts, etc., p. 430-31). Koji (p. 435). Lecithin (p. 447). Miso (p. 509). Natto (p. 530). Soybean (p. 739). Soy milk (p. 739-40). Soy sauce (p. 740). Tempe (or tempeh, p. 788). Tofu (p. 798-99), including plain tofu (dofu in Chinese), pressed tofu (*doufu-kan*, sic, *doufu-gan*), *wu-hsiang kan*, cotton tofu or momendofu, kinugoshi or silk tofu, sui-doufu, freeze-dried tofu [dried frozen tofu], smoked tofu. Cooked forms of tofu: Deep-fried tofu, doufu pok, cha-dofu, abura agé or deep-fried thin slices which can be opened to make Inari-zushi, ganmodoki or deep-fried tofu balls, yaki-dofu or tofu which has been grilled. Fermented tofu: The generic term is doufu-ru. The most popular type is white doufu-ru, and there is red doufu-ru, tsao-doufu, ch’ou doufu [chou doufu], Chiang doufu. In the Philippines fermented tofu is called tausi [sic, tahuri, tahuli; tausi is fermented black soybeans]. Miscellaneous: A specialty of Japan is *umesutsuke*, “tofu pickled in plum vinegar with a purple exterior.” Note: As of Oct. 2011 not one hit / result for umesutsuke can be found on Google. Nor have we ever heard of such a Japanese tofu product. Dofu nao (literally “bean brain”) or smooth curds, yuba or “bean curd skin” or “tofu skin,” okara or “presscake” (pulped skins of soya beans) (p. 798-99). Yuba (p. 860-61).

Also discusses: Alfalfa (p. 10). Almond (p. 12-13, incl. “almond milk”). Amaranth (p. 13). American cookbooks,



history (p. 15-17). Azuki beans (p. 44-45). Barley, barley breads, and barley sugar (p. 58-60). Beef-BSE (mad cow disease, p. 68). Chia (p. 166). Cowpea (p. 230-31). Chufa (p. 185). English cookery books, history (p. 276-80). Five grains of China (p. 305). Gluten (p. 341). Groundnuts (or peanuts, p. 356-57). Hemp (p. 377-78). Hydrogenation (p. 391). Japanese culinary terms (p. 415-17). Kudzu (p. 437). Linseed (p. 454-55). Lupin (p. 463). Margarine (p. 478-79). Mung bean (p. 518). Nori (p. 534). Noodles of China (p. 537, incl. "Gan si {soya bean noodles}" and "Fen si {also fen-szu} {mung bean vermicelli})." Oncom (p. 553-54). Quark (p. 644). Quinoa (p. 645). Seaweeds (incl. hijiki, kombu/konbu, nori, wakame, etc., p. 712). Sesame (p. 713). Shortening (p. 721-22). Sprouts (no listing). Tahini (p. 779). Toast (p. 797, incl. Melba toast). Ume and umeboshi (p. 817). Winged bean (p. 849).

The entry for "Fermentation" states that the two main reasons for subjecting a food to fermentation are: (1) To "convert it from a form that will not keep, such a milk, to one which will, such as cheese." (2) To "make foods which are indigestible in their original state, such as wheat or soya beans, digestible by turning them into products such as bread or tempe." Other benefits include improvements in flavour. Many do not realize that fermentation is part of the process of making coffee, cocoa, vanilla, and many kinds of sausage. A brief biography and nice portrait photo of Alan Davidson, a man of extraordinary knowledge in the world of food, appear on the rear dust jacket.

Note: The paperback edition of this book (2002) is titled *The Penguin companion to food*. Address: World's End, Chelsea, London, England.

1661. Nattô [Natto]. 1999. Tokyo: Asupekuto. 135 p. 20 cm. Series: Shihô no Dentoshoku (The Most Valuable Traditional Foods), no. 1. [Jap]\*

1662. Onajimi nattô de odoroki recipe (101 recipe): Gakken hit mook [Using natto to make 101 recipes that will surprise you: Available from Usenet]. 1999. Tokyo: Preschool. 73 p. 26 cm. [Jap]\*

1663. Sanginga, P.C.; Adesina, A.A.; Manyong, V.M.; Otite, O.; Dashiell, K.E. 1999. Social impact of soybean in Nigeria's southern Guinea savanna. Ibadan, Nigeria: International Institute of Tropical Agriculture. 34 p. [http://www.hubrural.org/IMG/pdf/iita\\_soybean.pdf](http://www.hubrural.org/IMG/pdf/iita_soybean.pdf) [52 ref]

• **Summary:** This case study surveyed 203 households in Benue State to determine the level of adoption of soybean using social impact assessment (SIA). The results showed soybean adoption rates rose from 9% of farmers in 1989 to 75% in 1997. The high adoption rates are attributed to improved material welfare, household income generation, and human capital development. This study also showed that soybeans were an acceptable substitute in traditional

foods. Virtually all the farmers used soybean dawadawa, 90% used soybean akpupa, a steamed bean flour cake, and 60% used soybean akwese, fried bean cakes. Innovative soybean utilization, such as soymilk, and a local 'tofu' were moderately adopted at 25% utilization (Summary by Shao 2002, p. 87). Address: 1, 3, 5. IITA, Ibadan, Nigeria.

1664. Sumi, Hiroyuki; Naoe, Katsushi. 1999. Nattô no susume: Shintai to kakei o tasukeru soshoku no ôsama [Recommending natto: The king of humble foods that helps body and home budget (economy)]. Tokyo: Pieichipi Kenkyujo (P.H.P. Research Lab). 210 p. 18 cm. Series: PHP Business Library; New Life. [Jap]\*

1665. Tamang, Jyoti Prakash. 1999. Development of pulverised starter for kinema production. *J. of Food Science and Technology (Mysore, India)* 36(5):475-78. [15 ref]  
• **Summary:** This starter was made using a selected strain of *Bacillus subtilis* KK2:B10 previously isolated from kinema prepared in the traditional way. It was dried in an oven at 70°C and ground aseptically. Only 1% of the pulverised starter, added to cooked soybeans, was need to make more kinema. Consumer taste tests showed that kinema made using the pulverised starter was more acceptable than market kinema. Address: Microbiology Research Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1666. Wei, Qun. 1999. Suitability of the selected American soybean cultivars for natto processing. MSc thesis, North Dakota State Univ. xiii + 135 leaves. 28 cm. \*  
Address: North Dakota State Univ., Fargo, North Dakota.

1667. Stephens, Roger; Stephens, Jane Ade. ed. and comp. 2000. Soyfoods guide 2000: Helpful tips and information for using soyfoods. Indianapolis, Indiana: Stevens & Associates, Inc. Distributed by the Soy Protein Partners. 24 p. Illust. No index. 28 cm. [23 ref]

• **Summary:** This guide is available only on a limited basis to dietitians and health professionals. Contents: Health: Add soy to diet to reduce heart disease (FDA recommends 25 grams of soy protein a day to reduce blood cholesterol levels), sample day soy meal planner (easy ways to add 25 grams of soy protein). Daily soyfood guide pyramid. Soy and your health—Scientists are learning about soy's health benefits: Isoflavones, heart disease, menopause & osteoporosis, cancer, allergies, diabetes & kidney disease, fat. Soyfood Descriptions: Meet the bean: Green vegetable soybeans (edamame), hydrolyzed vegetable protein (HVP), infant formulas, soy-based, lecithin, meat alternatives (meat analogs), miso, natto, nondairy soy frozen desserts, soy cheese, soy fiber (okara, soy bran, soy isolate fiber), soy flour (50% protein), soy grits, soy protein concentrate, soy protein isolate (isolated soy protein, 90% protein), soy protein,

textured (flour or concentrate), soy sauce (tamari, shoyu, teriyaki), soy yogurt, soybeans, soymilk, soy beverages, soynut butter, soynuts, soybean oil & products, sprouts, soy, tamari (see soy sauce), tempeh, Teriyaki sauce (see soy sauce), tofu & tofu products, whipped toppings, soy-based, yuba. Helpful charts: Soyfood substitutions, soyfood isoflavone content. Soyfoods web site. Soyfood composition. Recipes using: Meat alternatives, textured soy protein, whole soybeans, soy flour, soynut butter, soymilk, tofu. Address: 4816 North Pennsylvania Street, Indianapolis, Indiana 46205. Phone: 317-926-6272.

1668. Jacobi, Dana. 2000. *The joy of soy: 75 delicious ways to enjoy nature's miracle food*. Roseville, California: Prima Publishing. xii + 244 p. May. Illust. Index. 22 cm. Series: The natural kitchen. [16 ref]  
**• Summary:** This is basically a reprint of Dana's 1996 book titled *Soy! 75 Delicious Ways to Enjoy Nature's Miracle Food*, also published by Prima Publishing. It contains no new text and no new recipes; a few small errors have been corrected and the design of both covers and the title page is new. Address: Food writer, New York, NY.

1669. Kato, Hiroko. 2000. How to eat at a Japanese restaurant the vegan way. *Vegetarian Journal (Baltimore, Maryland)*. May/June. p. 20-23.  
**• Summary:** Describes how to avoid fish and bonito extract and flakes. Traditional Japanese vegan cuisine, called *shojin ryori*, was created by Zen Buddhists; it is very easy to enjoy beautiful and delicious Japanese vegan dishes at such restaurants. Sushi can include *natto maki*, *yuba maki*, or *inari-zushi* (rice wrapped in season aburage). Tofu dishes may include *yu-dofu*, *hiya yakko*, *tofu dengaku*, *agedashi-dofu*, and *goma-dofu* (made of sesame seeds; no soy). Other dishes: Edamame, miso soup, vegetable tempura, or *gyoza*.

1670. Sears, Barry. 2000. *The soy zone*. New York, NY: HarperCollins (ReganBooks). x + 338 p. Index. 25 cm. [216 ref]  
**• Summary:** Contents: Acknowledgments. Introduction. 1. The health benefits of soy. 2. Enter the soy zone. 3. Zoning your kitchen. 4. Soy zone cooking tips. 5. Soy zone meals. 6. Modifying your favorite recipes. 7. Fine-tuning the soy zone diet. 8. Your longevity report card: The tests you want to pass. 9. Insulin: Your body's Dr. Jekyll and Mr. Hyde. 10. Soy science. 11. How the soy zone diet stacks up against the traditional vegetarian diet. 12. Frequently asked questions. 13. World health implications for the soy zone diet. Appendixes. A. Technical support. B. Zone validation studies. C. Calculation of lean body mass. D. Zone food blocks for making soy zone meals. E. Synthesis of DHA. F. Glossary of terms. G. Resources. H. References.

Note: This book has all the hallmarks of a "quickie" written by a person who does not know his subject.

Moreover, we believe the nutritional science and dietary philosophy are seriously flawed. Address: Ph.D., Swampscott, Massachusetts.

1671. Carpenter, Joseph. 2000. Living in Boston and on the Oak Feed Miso Co. land in Rutherfordton, North Carolina from 1979 to 1980. Part I (Interview). *SoyaScan Notes*. June 2. Conducted by William Shurtleff of Soyfoods Center.  
**• Summary:** Joseph was born on 5 Aug. 1948 in Oakland, California, at Providence Hospital. He lived with his family in Berkeley until he was age 10; his father, who was a carpenter by trade, died in 1954, when he was still a boy. He and his mother then moved to nearby El Sobrante (by the back gate of De Anza High School—where he graduated from high school). He attended Contra Costa Junior College for two years, moved up to Sonoma State for a year, then dropped out. At age 19-20 (1967-68), he took off to see the world. As a young man, he became a skilled carpenter, learning by doing. Several of the men he worked with were good teachers.

A hippie during the 1960s, he met Patricia Roberts who was born in March 1947 in Queens, New York, and grew up in Rockaway Beach in Queens. Her father was a New York City police officer and detective for 20-25 years. Her parents retired to Florida in the late 1960s or early 1970s. When the kids were at home, they lived in a nice big home at Whitehouse Point; after the kids were gone, they moved to Deerfield Beach. Soon after meeting Patricia, Joseph stopped using psychedelics drugs and alcohol. They picked apples together in Hood River, Oregon, and lived in an old picker's camp. Having been overweight, he lost about 80 pounds in less than 6 months—and felt great. He and Patricia and a girl friend of hers migrated to Tucson, Arizona, where they were planning to pick oranges for the winter. While looking for a place to stay, they came across a macrobiotic bakery, The Granary, run by Jack Garvey. That was their first introduction to macrobiotics. Because of their largely raw food diet, they were somewhat resistant at first, but soon became friends and students of Jack's. In 1973 Joseph and Patricia were married in Arkansas.

1977 Feb.—Joseph arrives in Boston from Northern California; he is very sure of this date. He met Charlie Kendall (a maker of traditional natto, amazake, and mochi), who had just bought a house in Brookline by the railroad tracks; Joseph helped him extensively remodel that building. Charlie's wife, Yoko, was Aveline's sister. Joseph soon became friends with Bill Painter, who was a house painter by trade and also had a small shop in the basement of the Kushi's house. Before long Joseph was working as a carpenter with Bill Eggloff, building a handsome grain bin for Erewhon's retail store on Newbury Street. Using red oak and Plexiglas, they worked on it in the basement, which had a garage door that opened onto the alley behind the store. Bill, who lived on Cape Cod, stopped working for

Erewhon when the bin was finished. But the store needed more fixtures, so Joseph made a bid, signed a contract, then installed new check-out stands, new shelves, and units to hold the crocks of bulk tamari, barley malt, etc. Joseph had a family to support, and carpentry was his livelihood, so he was paid for all work he did in the Boston area. Later, over 4-day weekend, he worked to tear out old bathrooms and office spaces to open up the cramped front of the Erewhon store. He also did some work on a new Erewhon store in Brookline. After Erewhon moved out of their old 4-story brick warehouse, he worked on the huge modern warehouse that Erewhon moved into. The Kushi's house on 62 Buckminster Road had been the headmaster's house for a private school. Upstairs there was an institutional bathroom. Aveline asked Joseph to remodel it to make a private bathroom—with lots of tile. After about a year of working for the macrobiotic community (always for pay), Joseph got "burned out" and went to work for a regular contractor unconnected to macrobiotics.

1977 Christmas—Joseph and Patricia go to Florida for Christmas, one of many trips they took there. In early 1978 Joseph worked as a carpenter for several months in Sandy Pukel's Oak Feed Restaurant in Coconut Grove, Florida. He had gotten to know Sandy because his wife, Patricia, and Sandy were close friends; they had first met when they both went to a seminar Michio Kushi gave in Coconut Grove. After the restaurant opened, in about May 1978, Joseph and Patricia took a vacation to Jamaica. During the summer and fall of 1978 Sandy came to Boston several times. Each time he and Patricia and Joseph went out to dinner together. Sandy mentioned that he was thinking of starting a miso company and asked if they might be interested in getting involved. They expressed interest, but no definite plans or offers were made.

1979 Feb.—Joseph's second child, Benjamin, is born in Boston to his wife Patricia. The Carpenters took many trips to Florida, especially during the winter, to visit Patricia's parents. In about March 1979, over a long weekend, when Patricia and their two children were vacationing in Florida (visiting her parents), Sandy Pukel paid for Joseph to fly from Boston to South Florida for a meeting to discuss the part that the Carpenters might have in the development of the new miso company. Sandy knew Joseph's skills as a carpenter. Joseph recalls that the meeting was at Edmund Benson's house. Sandy said that he wanted Patricia and Joseph to become part of the miso company. In exchange for their labor, they would be given a share of the business ownership worth \$25,000. Joseph does not recall whether they would receive the \$25,000 once or each year that they worked—but he definitely recalls the \$25,000 offer. Joseph recalls that the talk at this first meeting was very general in terms of what kind of carpentry or construction work he would do for the company.

1979 May (late)—Joseph leaves Boston in his van,

headed for North Carolina—after handing over their house to the next renters. On the way, following Sandy's instructions, he stops in Hendersonville, North Carolina, for about a week to check out some real estate. With real estate agents that Sandy Pukel and/or Edmund Benson had found, Joseph looks at property the agents thought might be appropriate for the miso company in the Asheville area and in Rutherford County. As far as he knows, Joseph was the first person to actively look for land for the miso company. They found several properties that Joseph considered borderline, so Sandy (and probably John Belleme and Edmund) flew up from Florida and they all visited these sites together. Finding nothing that was suitable, they left. Joseph continued on to Florida in his van to be with Patricia and their children. Sandy continued to work with local realtors until he found a suitable piece of property. Joseph is quite sure that just before they finally purchased the land in Rutherfordton, Sandy, Michio and he (and perhaps a few other people) all went to see the property at the same time. They walked over the roughly 100 acres of land and through the beautiful house.

During the summer of 1979 Joseph and Patricia met with Sandy and Edmund several times to discuss their living on the miso company land while John and Jan Belleme were away studying miso-making in Japan. Though nothing was put into writing, Joseph and Patricia both recall clearly that their daily expenses would be taken care of, they would work on the land, and, at the end, they would own a part of this new business. They were not given any specific list of tasks or duties they were expected to accomplish. Continued. Address: 10655 Lakeshore Dr., Clear Lake, California 95422. Phone: 707-994-3218.

1672. Chang, Chen-Tien; Fan, M.H.; Kuo, F.C.; Sung, H.Y. 2000. Potent fibrinolytic enzyme from a mutant of *Bacillus subtilis* IMR-NK1. *J. of Agricultural and Food Chemistry* 48(8):3210-16. Aug. [34 ref]

• **Summary:** This mutant natto bacterium is used to make domestic natto in Taiwan. A strong fibrinolytic enzyme was purified from the culture media. The enzyme, which had an optimal pH of 7.8, an optimal temperature of 55 degrees C., showed activity for hydrolysis of fibrinogen. Various tests indicate that the enzyme is a subtilisin-like serine protease, similar to nattokinase from *Bacillus natto*. Address: Dep. of Food and Nutrition, Providence University, Shalu, Taiwan, Republic of China.

1673. Kiers, J.L.; Van Laeken, A.E.A.; Rombouts, F.M.; Nout, M.J.R. 2000. In vitro digestibility of *Bacillus* fermented soya bean. *International J. of Food Microbiology* 60:163-69. Sept. 25. [10 ref]  
Address: Wageningen Univ., Agrotechnology and Food Science, Lab. of Food Microbiology, Bomenweg 2, 6700 EV, The Netherlands.

1674. Hagler, Louise. 2000. Soja: Wandelbarste Bohne der Welt. Eine 'coole' Proteinquelle [Soya: The most versatile bean in the world. A 'cool' source of protein]. Aitrang, Germany: Windpferd. 140 p. Illust. Index. 18 cm. [Ger]

• **Summary:** Foreword by Peter Golbitz. Foreword by Louise Hagler. Introduction by Dr. Mark and Virginia Messina. Basic soyfoods. Feeding babies and children soyfoods. Breakfast, brunch & bread. Whole soybeans. Sauces, spreads, dips & dressings. Soup & salad. Main dishes. Desserts. Drinks & yogurt.

No dairy products or eggs are used; honey is called for in some recipes. Address: The Farm, Summertown, Tennessee.

1675. Cleland, Nora T. 2000. Couple takes unique approach to farming. *Farm Talk (Parsons, Kansas)*. Oct. 18.

• **Summary:** Innovation is the watchword for Lee and Cindy Quaintance who farm near Edgerton, Kansas, close to Olathe.

Their main crop is organic soybeans, especially those varieties made into tofu. This year they are trying another variety named "Nato" [for making natto], which is smaller than most soybeans. Whereas the count of typical soybeans is about 3,500 per pound, "the little Nato beans run about 6,500 beans per pound."

They have found a company in Garden City, Missouri, which will buy the Nato beans and export them directly to Japan. They expect to be paid about \$15 a bushel, but that isn't quite as lucrative as it sounds because Nato yields only about 35 bushels per acre.

When growing soybeans organically, they have found that it is easier when they are planted in rows 36 inches apart rather than 30 inches. The beans rapidly grow and shade a 10-inch space on both sides of the row—which eliminates the need for herbicides. Still he cultivates the area between the rows once each season to eliminate weeds.

1676. Ishigami, Takashi. 2000. Contract grow and IP [identity preserved] handling systems for the Japanese food soybean market. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 117-120.

• **Summary:** Japan is the world's largest soybean importer. Of the 4.9 million tonnes (metric tons) imported, about one million tons (actually 960,000 tonnes or 19.6%, called "food soybeans") are used for making tofu, miso, natto, soysauce, etc. The rest are crushed to make soybean oil and meal.

A table (p. 118) shows the quantity of soybeans obtained from various sources to make each of the major Japanese soyfoods in 1998, 1999, and 2000. In the year 2000, some 512,000 tonnes were used to make tofu, 168,000 tonnes for miso, 125,000 tonnes for natto, 40,000 tonnes to make soy

protein and products, 30,000 tonnes to make soysauce (from whole soybeans), 6,000 tons to make soymilk, and 79,000 tons to make other products. Grand total 960,000 tonnes. Address: Marubeni Corp., Japan.

1677. Kim, Jung-In; Han, Jung-Hee; Kang, Min-Jung; Kwon, Tai-Wan. 2000. The hypoglycemic effect of *Chongkukjang* in normal rats. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 171-172. [3 ref]

• **Summary:** *Chongkukjang* is fermented Korean soybean paste very similar to natto.

Note: This is the earliest English-language document seen (Jan. 2012) that uses the spelling "Chongkukjang" to refer to Korean style natto. Address: Dep. of Food and Nutrition, Inje Univ., Kim-Hae, Kyung-Nam province, South Korea.

1678. Maneepun, Saipin. 2000. Prospect of traditional fermented soybean products in Thailand. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 707-10. [8 ref]

• **Summary:** Tables: (1) Traditional fermented soybean products in Thailand.

Soysauce (local name *si-iu*).

Soypaste [Thai miso] (local name *tao-chew*).

Fermented soy curd [fermented tofu] (local name *tao-hu-yi*). Made in central Thailand using bacteria, yeasts and molds (*Actinomucor elegans*) on tofu cubes. They are yellowish or red in color. The yellowish product is eaten directly as a relish, whereas the red product is cooked with vegetables or meat. Making fermented soy curd involved three steps: preparing the tofu, molding, and brine fermentation and aging. First a pure culture of the mold is applied to the surface. Then it is incubated at 20°C for 3-7 days. Finally it is aged in brine for about 40-60 days to develop flavor and aroma. Used as both a main dish and flavoring agent. The product is made in small-scale factories, as well as in soysauce and soypaste factories. The composition is given in Table 2.

Fermented whole soybean (local name *thua-nao*). Made in north Thailand from whole soybeans fermented with bacteria [like Japanese natto]. A paste or solid used as a main dish or flavoring.

Imitation fried pork rind (local name *kap-mu-tiem*). Made in north Thailand from fermented tofu. A solid. Used as a snack. Address: Inst. of Food Research and Product Development, Kasetsart Univ., Bangkok 10903, Thailand.

1679. Muramatsu, Kanako; Katsumata, Rie; Watanabe, Sugio; Tanaka, Tadayoshi; Kiuchi, Kan. 2000. Improvement of itohiki-natto manufacturing process employing

commercial natto starters. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 333-34. [1 ref]

• **Summary:** In order to improve the quality of natto in Japan, changes in the incubation temperature program and of the amount of oxygen consumed within the natto packages were measured as a function of time. Four programs of temperature regulation were devised. In the one considered best (No. 4): The temperature was initially set at 40°C, then raised to 47°C between the 12th and 17th hour—at which point the temperature in the package rose as high as 52°C. After the 20th hour, the temperature was cooled to 4°C.

Three commercial natto starters (A, B and C) made by three different companies were used. Five large-seeded soybean varieties used to make tofu and four small-seeded varieties used to make natto were studied; all were harvested in 1999.

Natto made by temperature regulation program No. 4 was twice as viscous that made by program No. 1. The natto made by Starter C was especially viscous. Natto made from Suzuyutaka soybeans had the best flavor. Although it is generally said that small-seeded soybean varieties make better natto than large-seeded ones, the latter were found to be as good as the former for making natto in this study. Address: Faculty of Home Economics, Kyoritsu Women's Univ., Hitotsubashi, Chiyoda-ku, Tokyo 101-8433, Tokyo.

1680. Muramatsu, Kanako; Katsumata, Rie; Watanabe, Sugio; Tanaka, Tadayoshi; Kiuchi, Kan. 2000. Natto manufacturing methods employing natto bacilli with high elastase activity and its mutants. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 335-36. [1 ref]

• **Summary:** This process begins by forcing bacteria to mutate by irradiating them with ultraviolet (UV) radiation. Elastase is an enzyme which, when obtained from a pig's pancreas, is sold as a medicine. The goal of the mutation was to create and isolate one strain of elastase-producing natto bacilli, plus a second strain that did not require leucine, an essential amino acid (also called  $\alpha$ -amino acid).

But natto made from the mutants was not viscous. So a new program of temperature regulation was devised. When the temperature was initially set at 42°C, then raised to 47°C after 8 hours, held there for three hours, then reduced to 42°C after 24 hours [which does not add up!], the natto made from the mutant strains was viscous.

Note: How far are you willing to go to make your natto taste a little better? Address: Faculty of Home Economics, Kyoritsu Women's Univ., Hitotsubashi, Chiyoda-ku, Tokyo 101-8433, Tokyo.

1681. Saio, Kyoko. ed. 2000. Proceedings—Third

International Soybean Processing and Utilization Conference: Dawn of the innovative era for soybeans. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. Held 15-20 Oct. 2000, Tsukuba, Ibaraki, Japan. Illust. Author index. 30 cm. [Eng]

• **Summary:** The first international conference of this type was held in Jilin, China, in 1990. The second was held in January 1996 in Bangkok, Thailand. Foreword. Program committee for ISPUC-III. Contents: Keynote session (3 papers). Session 1: Production for processing and utilization (20 oral presentations/papers, 22 poster presentations). Session 2: Quality control (13 oral, 7 poster). Session 3: Nutrition and physiological functionality (23 oral, 25 poster). Session 4: Traditional products (23 oral, 19 poster). Session 5: Modern processing and utilization of foods (32 oral, 20 poster). Session 6: Edible oil and feeds (9 oral, 5 poster). Session 7: Innovative non-food uses (10 oral, 4 poster). Session 8: Strategies for dissemination (18 oral, 4 poster). Satellite session: Monodisperse microspheres and microchannel technologies (12 oral, 15 poster). Public symposium: The miracle of Asia—Marvelous fermented soyfoods (6 oral presentations/papers). Author index. Sponsors: Organizations/companies (55), individuals (33), others (8). Within each category, listed in order of date contributed. Exhibitors (29; an exhibition was held with the Conference). Advertisers (6 companies purchased full-page black-and-white ads). Address: Chair of the Program Committee, ISPUC-III, Tsukuba, Japan.

1682. Takemura, Hiroshi; Ando, Noriko; Tsukamoto, Yoshinori. 2000. [Breeding natto bacteria that do not produce branched short-chain fatty acids and their application to production of natto without a strong smell]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 47(10):773-79. [23 ref. Jap; eng]

• **Summary:** "Natto contains branched short-chain fatty acids (BCFAS), such as isobutyric acid, isovaleric acid, and 2-methylbutyric acid. These BCFAS have an unpleasant smell. To produce light-smelling natto, we tried to develop BCFAS non-producing natto bacteria."

"The natto fermented by B2 strain was valued highly as a light-smelling natto by sensory evaluation. Finally, we obtained the LDH-defective mutants by chemical mutagenesis to utilize in commercial production of natto. The mutants produced little BCFAS like B2, and the natto fermented by the mutants had lighter smells" (from journal@rchive). Address: Mistukan Group Corporation, 2-6, Nakamura-cho, Handa-shi, Aichi prefecture 475-8585, Japan.

1683. Tamang, Jyoti Prakash. 2000. Microbial diversity associated with natural fermentation of kinema. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin

Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 713-12. [19 ref]

• **Summary:** In the Himalayan regions of India, Nepal and Bhutan, kinema is made only by women, using their traditional knowledge. "Microorganisms associated with kinema are present in or on the ingredient, utensils, wrapping materials, or in the environment, and are selected through adaptation to the substrate, which also contributes significant genetic resources in the food ecosystem. Species of *Bacillus*, *Eterococcus*, *Geotrichum*, *Candida*, etc. have been recovered, identified and preserved."

Tables: (1) Load of microorganisms associated during traditional production of kinema with: Raw soybean, soaked soybean, cooked soybean, wood ash, wooden mortar, wooden pestle, fern leaves, Ficus leaves (local fig), fresh kinema, kinema.

(2) Enzymatic profiles of bacterial strains isolated from different sources during kinema production. Address: Food Microbiology Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1684. Watanabe, Shaw; Uesugi, S.; Zhuo, X. G.; Uehara, M.; Takamatsu, K. 2000. Effects of soy rich diet and isoflavone supplement on healthy women. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 203-206. [8 ref]

• **Summary:** Japanese consume 20-30 mg/day of isoflavones on average. This isoflavone intake is mostly attributable to tofu, natto, and miso. Address: 1-4. Dep. of Nutritional Science, Tokyo Univ. of Agriculture, Tokyo 156-8502, Japan; 5. Research Inst. of New Materials, Fuji Oil Company.

1685. Wei, Q.; Wolf-Hall, C.; Chang, K.C. 2000. Characteristics of natto made from four American soybean cultivars. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 337-38. [5 ref]

• **Summary:** Seven samples of four soybean varieties, Danatto (1995, 1996), Minnatto (1994), Natto King (1994, 1995), and Experiment 95315 were grown on farms in North Dakota.

Seed characteristics preferred for natto in soybean cultivars: round shape, small size and weight, uniform size, smooth seed coat, white to pale yellow color, clear hilum, and high stachyose content. When the natto bacteria break down stachyose into simple sugars, the fermentation proceeds at the desired speed. A high sucrose content is not desirable because the fermentation proceeds too rapidly.

Considering the overall characteristics, Donatto was considered the most desirable for making natto and Natto King the least desirable. Address: Dep. of Cereal Science, North Dakota State Univ., Fargo, ND 58105.

1686. Yan, Jeong-lye; Kwon, Tae-wan; Song, Young-sun. 2000. Enhancement of the fibrinolytic activity in plasma by oral administration of *Chongkukjang*. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 175-176. [2 ref]

• **Summary:** *Chongkukjang* is Korean-style natto fermented with *Bacillus circulans* K1 that produces strong fibrinolytic enzymes. The fibrinolytic activity of *chongkukjang* was tested in spontaneously hypertensive rats (SHR) by acute and chronic administration of *chongkukjang* extract and *chongkukjang* base. A graph shows that the fibrinolytic activity peaked 1 hour after administration. Address: 1. Dep. of Food Science and Technology, Kyungsung Univ., Pusan 608-736; 2. Dep. of Food Science and Nutrition, Inje Univ., Kimhae 621-749, Korea.

1687. Yang, Jeong-Lye; Kim, H-S.; Song, Y-S. 2000. Purification of fibrinolytic enzyme from *chongkukjang*. In: Kyoko Saio, ed. 2000. Proceedings—Third International Soybean Processing and Utilization Conference. Tokyo, Japan: Korin Publishing Co., Ltd. [xxiv] + 728 + 8 p. See p. 220-21. [2 ref]

• **Summary:** *Chongkukjang* is a traditional Korean fermented soybean paste. A new method of treating thrombosis has been widely sought, due to the limitations of present thrombolytic agents. "If a fibrinolytic enzyme is produced by food-grade microorganisms in a fermented food, the food can be consumed to prevent thrombosis and other related diseases." In this study the writers report a novel fibrinolytic enzyme from *chongkukjang* fermented with *Bacillus circulans* K-1.

This enzyme was smaller than that of nattokinase (27,700 Daltons) or *chongkukjang* kinase (28,200 Daltons).

Note: *Chongkukjang* appears to be a relative of Japanese natto, which is fermented by *Bacillus subtilis* (natto). Address: 1-2. Dep. of Food Science and Technology, Kyungsung Univ., Pusan 608-736; 3. Dep. of Food Science and Nutrition, Inje Univ., Kimhae 621-749, Korea.

1688. *Canadian Soybean Bulletin (OSG, Chatham, Ontario, Canada)*. 2000. Incoming Japan soybean mission. 14(2):1. Nov.

• **Summary:** Japan imports 5 million tonnes (metric tons) or 184 million bushels soybeans each year. Of that, about 1 million tonnes (20%, or 37 million bushels) are used to make soyfoods such as tofu, miso, natto, soy sauce, etc. Of the 1 million tons, 500,000 tonnes (50%) are for tofu, 160,000 tonnes (16%) are for miso, and 130,000 tonnes for natto.

Exports of Canadian soybeans have been increasing rapidly, from 36,000 tonnes in 1995, to 75,000 tonnes in 1998, to 175,000 tonnes in 2000.

In Sept. 2000, the Canadian Soybean Export Association and the Ontario Soybean Growers hosted ten Japanese from

the soyfoods industry and showed them the Canadian soybean industry. These Japanese were most appreciative “of our efforts to segregate GMO and non-GMO varieties of soybeans using our Identity-Preserved, or IP program.”

1689. Sumi, Hiroyuki; Sasaki, Tomohiro; Yatagai, Chieko; Kozaki, Yasutaka. 2000. [Determination and properties of the fibrinolysis accelerating substance (FAS) in Japanese fermented soybean “Natto”]. *Nihon Nogei Kagakkai Shi (J. of the Agricultural Chemical Society of Japan)* 74(11):1259-64. Nov. [17 ref. Jap; eng]

Address: 1. Dep. of Physiological Chemistry, Kurashiki University of Science and the Arts, 2640 Tsurajima-cho, Kurashiki, Okayama prefecture 712-8505, Japan.

1690. *SoyaScan Notes*. 2000. Chronology of major soy-related events and trends during 2000 (Overview). Dec. 31. Compiled by William Shurtleff of Soyfoods Center.

• **Summary:** Jan. 8—The Kerry Group (of Wisconsin and Iowa) purchases Solnuts, a pioneer manufacturer of dry-roasted soynuts, in Hudson, Iowa.

Jan.—Kraft Foods Inc. (Illinois) purchases Boca Burger Inc., America’s third largest maker of veggie burgers, after Worthington Foods and Gardenburger.

March 6—The Hain Food Group announces that it will acquire the Celestial Seasonings tea company to become the largest natural foods company in the USA.

March 9—The USDA formally approves a rule change allowing soy protein products to completely replace meat products in the Federal School Lunch Program.

March 31—Monsanto, the world’s leading agricultural biotech company, merges with Pharmacia & Upjohn (a large pharmaceutical company), and the new company is renamed Pharmacia Corporation.

April—An article by Lon White on tofu and brain aging is published in *J. of the American College of Nutrition*.

June 9—20/20 (ABC) television program, titled “Soy—The untold story,” airs on Friday at 10:00 p.m. discusses many of the shortcomings of soyfoods, but in a very fair way.

June 13—Martha Stewart, on her popular nationwide TV program *Living*, has a very positive segment on edamamé.

July 14—Lightlife Foods Inc. (of Turners Falls, Massachusetts) is purchased by ConAgra Inc., a \$25 billion food company based in Omaha, Nebraska—for an undisclosed amount. Lightlife’s plant, employees, and management team will stay in place. Lightlife is a leading maker of vegetarian meat alternatives, with 150 employees and about \$25 million in annual sales.

July—At a joint meeting of ASA and USB, the International Soy Protein Program (ISPP) was born as ASA and the Illinois Soybean Program Operating Board (ISPOB) formalized their joint commitment to “Increase the international consumption of soy protein by humans in

new markets—developing countries—and thereby create new opportunities for disappearance of soybeans and provide higher economic returns to U.S. soybean producers.” ISPOB and its Executive Director Lyle Roberts were instrumental in conceiving the program and raising its initial funding. This program was later renamed WISHH.

Sept.—Monsanto’s patent on glyphosate expires. Glyphosate is the active ingredient in *Roundup*, the world’s best-selling herbicide.

Dec.—Sanitarium Foods of Australia acquires the 47% of SoyaWorld owned by Sunrise Soya Foods (Vancouver, BC, Canada).

Trends: 1. This year, the momentum created by the FDA health claim in Oct. 1999 has propelled the soyfoods industry to new heights. Existing companies are growing rapidly, and many new companies (including some of America’s biggest food companies) are entering the market with new products.

2. This year, for the first time, soymilk has become a mainstream American beverage. As of May, White Wave Silk soymilk is sold in 24,000 supermarkets nationwide. Edamamé (green vegetable soybeans) have gone mainstream in California, and are rapidly becoming popular on both coasts of the USA.

3. In the United States and Europe, the tide seems to be flowing increasingly against genetic engineering of foods and food plants. More and more companies in the natural foods industry are labeling their products as “non-GMO” or “GMO-free” or “No GMOs.” Monsanto has stopped its efforts to develop genetically engineered soybeans for food use and focused its attention instead on livestock feeds. It now seems likely the genetic engineering of plants has a future, but not in the area of foods—at least in developed countries.

4. Interest in “food-grade soybeans” continues to grow in the USA and has increased substantially this year. Canada began focusing on identity-preserved food-grade soybeans 10-15 years before the USA. U.S. interest began to grow in about 1995 with the introduction of genetically engineered soybeans and with the accelerating interest in food uses of soybeans.

5. While pro-soy articles (mostly about health benefits) continue to increase, so do anti-soy articles and Internet sites. The loudest anti-soy voices are those of Sally Fallon and Mary Enig of the USA (they believe traditional fermented soyfoods—such as miso, shoyu, natto, and tempeh—are good, traditional non-fermented soyfoods—such as tofu, soymilk, and edamamé—are not very good, and modern soy protein products—such as soy protein isolates, concentrates, and textured soy flour—are the worst of all, being highly processed with chemicals such as hexane solvent). Also Richard and Valerie James of New Zealand, and Lon White of Hawaii. Some of the concerns they raise are legitimate and deserve further research, but the majority (we believe) are not. Nevertheless, many of the health claims made for soy

in popular articles are exaggerated or somewhat sensational, and not firmly supported by scientific evidence.

6. As we are about to enter a new century and a new millennium on 1 Jan. 2001, soyfoods appear to have a bright future, worldwide. This past year has seen more activity and interest in, and media coverage of, soyfoods than at any time in the history of the United States.

1691. Fisher, Kate. 2000. Using the old bean: Commodity soybeans aren't left out of soyfoods surge. *Soybean Digest*. Dec. p. 12, 16.

• **Summary:** Walt Fehr says that in the soyfood market there are two types of beans: Specialty beans (premium market) and commodity beans (general market). Low-cost commodity beans are used for such things as soy oil plus some soy protein concentrates, soy isolates and soy flour.

Until recently, Japanese food processors bought large amounts of what they call IOM (Indiana, Ohio, Michigan) soybeans. These are commodity beans that the Japanese believe have higher protein content and are better for food uses than commodity beans grown in other parts of the USA. But biotech issues [concerning genetic engineering] have caused IOM soybeans to lose considerable market share to identity-preserved soybeans—most of which are non-GMO.

The premium food-grade market consists of many soybeans: (1) Small seeded types for natto and soy sprouts. (2) Large-seeded soybeans for edamame, miso, and tofu. (3) Other soybeans with special traits for food use, such as high protein, lipoxigenase free, low saturated fat, low linoleic acid, etc.

Note: This article is bizarre. The words “organic” and “non-GMO” are barely mentioned.

1692. Kanai, Y.; Kimura, M.; Kiuchi, K.; Muramatsu, K.; Yamawake, N.; Yoshimi, T. 2000. [Purification and crystallization of a new *Bacillus subtilis* elastase]. *Kaseigaku Zasshi (J. of Home Economics of Japan)* 51:1127-35. \*

1693. Watanabe, Sugio. 2000. [Growth market: International industrialization of fermented beans production]. *Research J. of Food and Agriculture (Tokyo)* 23:28-33. [142 ref]\*  
Address: Biotechnology Inst. of Natto, Suzuyo Kogyo Co. Ltd. Both: Tokyo, Japan.

1694. Diawara, Brehima; et al. 2000. HAACP system for the traditional African fermented foods: soumbala. Ouagadougou, Burkina Faso: Département de Technologie Alimentaire, Centre National de la Recherche Scientifique et Technologique; and World Association of Industrial and Technological Research Organizations. \*

• **Summary:** Locust beans and soybeans have different advantages when used to make dawa-dawa, but current trends seem to favor expanded soybean use. Locust beans, the traditional ingredient familiar to dawa-dawa makers are

relatively easily gathered [except in the tops of tall trees] when the trees come to fruit; soybeans, however, require cultivation and water. Also, the sweet pulp of the locust beans can be eaten raw or processed to make a snack. The African locust bean tree grows to a height of about 10 to 25 meters (32.8 to 82 feet) and may produce 25 to 100 kg (55 to 220 lb) of fruit (pods) containing about 30% by weight of seeds in a year. Therefore, in areas where these trees are abundant and fruitful, it is possible to obtain surpluses for sale of the pods or of dawa-dawa elsewhere. In fact, ripe pods are often sold in local markets throughout West Africa.

Soybeans, on the other hand, are easier to prepare, and being smaller, take only about a quarter as long to cook.  
Address: Burkina Faso.

1695. Koizumi, Takeo. 2000. Nattô no kairaku [The pleasures of natto]. Tokyo: Kodansha. 221 p. 20 cm. Series: New Fifties. [Jap]\*

1696. Kulp, Karel; Ponte, Joseph G., Jr. eds. 2000. Handbook of cereal science and technology. 2nd ed., revised and expanded. New York, NY: Marcel Dekker. ix + 790 p. Illust. Index. 29 cm. Series: Food Science and Technology, No. 99.  
• **Summary:** Chapter 26, “Fermentation and microbiological processes in cereal foods,” by Pierre Gélinas and Carole McKinnon (of Food Research and Development Centre, Agriculture and Agri-Food Canada, St. Hyacinthe, Quebec, Canada) (39 refs) (p. 741-54) contains a long table (p. 742-46) titled “List of foods prepared from fermented cereals.” The four columns are: (1) Food name (synonym or related food). (2) Food type (characteristics). (3) Area (country or continent). (4) Main microorganisms.

Under “Soybeans” the following foods are listed: Chee-fan. Chinese yeast. Hama-natto. Kenima. Ketjap. Meitauza. Meju. Miso (chiang, doenjang, kochujang, tauco). Natto. Soy sauce (kanjang, kecap, kicap, shoyu, taosi [sic]). Sufu (tahuri, taokoan tao-hu-yi). Tairu (taire—fermented soybean milk, like yogurt, from Malaysia). Taotjo. Tempe (tempeh).

“Chee-fan” is described as “Curd-like” [fermented tofu] from China. Main microorganisms: *Mucor* spp., *Aspergillus glaucus*.

Note 1. Taokoan (listed under Sufu, above) is not a fermented food. It is the Filipino equivalent of Chinese *doufu-gan* or “pressed tofu.” Filipino fermented tofu is *tahuri* (also spelled *tahuli*).

Table 2, “List of representative microorganisms associated with fermented cereal foods” (p. 74-48) contains two columns: (1) Type of microorganism (and within type, genus and species, listed alphabetically by genus). (2) Food produced.

Under “Bacteria” are: *Bacillus natto*—Hama-natto [sic], natto. *Lactobacillus delbrueckii*—Miso, soy sauce. *Pediococcus* spp.—Hamanatto. *Pediococcus halophilus*—Soy sauce. *Streptococcus* spp.—Hama-natto.



Under “Bacteria” are: *Actinomucor elegans*–Meitauza, sufu. *Aspergillus glaucus*–Chee-fan. *Aspergillus oryzae*–Hama-natto, ketjap, meju, miso, saké, soy sauce. *Monascus purpureus*–Anka (ang-kak, beni-koji, red rice), hong-ru (lao-hong). *Mucor* spp.–Chee-fan, ruhi, sufu. *Mucor hiemalis*–Sufu. *Rhizopus oligosporus*–Tempe.

Under “Yeasts” are: *Candida* spp.–Soy sauce. *Zygosaccharomyces rouxii*–Miso, soy sauce.

The section on “Major commercial fermentation processes” includes (p. 752-53) soy sauce (from wheat and soybeans) and miso (from rice and soybeans).

Note 2. Koji, the basis of soy sauce, miso, and saké fermentations, is not mentioned in either of the first two tables. However it is mentioned by name on p. 753. Address: 1. American Inst. of Baking; 2. Prof. Emeritus, Kansas State Univ. Both: Manhattan, Kansas.

1697. McMann, Mary Carol. 2000. Soy protein: What you need to know. New York, NY: Penguin Putnam Inc. (Avery). 60 p. Index. 22 cm. Avery’s Nutrition Discovery Series. [74 ref]

• **Summary:** Contents: Introduction. 1. What makes soy so special? 2. Cardiovascular disease. 3. Cancer. 4. Osteoporosis. 5. Menopause and menopausal symptoms. 6. Incorporating soy (protein) into your diet. Conclusion. Glossary. References. About the author.

Note: This book is copyrighted by Protein Technologies International. Address: MPH, RD, LD, Houston, Texas.

1698. Wilkinson, Endymion Porter. comp. 2000. Chinese history: A manual. Revised and enlarged. Cambridge, Massachusetts: Harvard University Press / Harvard Yenching Institute. xxiv + 1181 p. Index. 23 cm. Harvard Yenching Institute Monograph Series, 52. 1st ed. 1998. [500+\* ref]

• **Summary:** A remarkable and extremely valuable book. Partial contents: Introduction: Recent historiographical trends, center and periphery, periodization, the dynasties. I: Basics. 1. Language. 2. Dictionaries. 3. People. 4. Geography. 5. Chronology. 6. Telling the time. 7. Statistics: Numbers and order of magnitude, population, weights and measures, money, prices. 8. Guides and encyclopedias. 9. Locating books. 10. Locating secondary sources. 11. Libraries.

II: Pre-Qin sources. 12. Archaeology. 13. Pre-Qin archaeology. 14. Prehistoric signs and symbols. 15. Oracle bone inscriptions. 16. The characters: Evolution and structure. 17. Epigraphy. 18. From bamboo strips to printed books. 19. Excavated and transmitted texts.

III: Historical genres. 20. Primary and secondary sources. 21. Annals. 22. Standard histories. 23. Topically arranged histories. 24. Miscellaneous histories. 25. Government institutions. 26. Official communications. 27. Law. 28. War.

IV: Other primary sources... 35. Agriculture, food and

the environment. 36. Medicine. 37. Technology and science... 42. Foreign accounts of China.

V: Primary sources by period.

In the chapter titled “Agriculture, food and the environment,” section 35.2.2 on “Pre-Qin foodstuffs and cooking” (the Qin dynasty, 221-206 B.C., came just before the Han) states that the staple dishes, cooked mainly by boiling or steaming, were typically “accompanied by a savory paste (*jiang*, *misô* in Japanese) made from hydrolyzed (fermented) meat, fish, crustaceans, or, most important of all, soybeans” (Footnote 8). “The soybean is indigenous to northeast China. Its cultivation began in the Zhou period. It was a major source of protein, especially for peasants and laborers. Starting in the Yangzi valley, it was brined and hydrolyzed into the characteristic Chinese flavoring, soy sauce (*jiangyou*) (9). By the Han, a new process had been discovered; if the production was interrupted half way and the beans dried, they became blackened and delicious. Along with savory pastes (*jiang*) and pickles (*zu*), these fermented soybeans (*chi*) were immensely popular (10).”

Footnote 8: See *Zhongguo shiqian yinshishi* (A history of Chinese prehistoric food and drink), Wang Renxiang, ed. in chief, Qingdao, 1997.

Footnote 9 (p. 638): “The origin of ‘soya’ in European and other languages is from either *xiyao* [fermented black soybean sauce] or *shôyu* (the Cantonese and Japanese for *jiangyou* [soy sauce] respectively). The early generic word was *shu* (*Glycine max*), later *dou*, and later still *dadou* to distinguish it from post-Han imported pulses.”

Footnote 10: “*Chi* used to be pronounced *shi*. Other names for *chi* were *douchi*, *daku*, and *nadou* (*nattô* in Japanese).”

Section 35.2.3 on “New foodstuffs and cooking” covers the period from the beginning of the Han dynasty in 202 B.C. Noodles (*bing*) were introduced. Soybeans (in the forms of *jiang* and fermented black soybeans {*chi*}) remained an important source of protein. Alfalfa (*musu* or *mushu*), peas (*hudou*, modern *wandou*), and sesame (*huma*, modern *zhima* or *mazi*) are said to have been introduced by Zhang Qian, the emissary from the Former / Western Han dynasty. By the Tang “bitter fermented blackened soy beans” (*huchi*) had been introduced; *hu* means “barbarian.” Tofu (*doufu*) is first mentioned in the early Song dynasty. It was imported into Japan and first appeared there in a document dated 1183. “It was used as a substitute for meat and fish in Buddhist vegetarian cooking.” New World crops which made their way into China from the 16th century include peanuts (*fandou*, modern *huasheng*), chili, corn, sweet potatoes, and tomato (p. 643).

Note: The author was educated in England. Address: Head of Delegation and Ambassador to China for the European Commission.

1699. Ibe, Sachie; Kumada, Kaoru; Yoshibe, Mineko; Onga,

Tsutomu. 2001. [Production of natto which contains a high level of isoflavone aglycons]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 48(1):27-34. [13 ref. Jap; eng]

• **Summary:** “To our knowledge, this is the first report to indicate that *B. subtilis* (natto) possesses beta-glucosidase [an enzyme] with the ability to hydrolyze isoflavone glycoside.” Address: 1, 3-4. Ohyamato Co., Ltd., 575, Shirone, Isehara-shi, Kanagawa-ken 259-1147, Japan.

1700. Okamura, Ao. 2001. Korede wakatta Mito nattô no nazo: Shizen shokuhin [Now I've understood the mystery of Mito nattô: Its a natural food]. Tokyo: Tokyo Shinbun Shuppan Kyoku. 159 p. 19 cm. [Jap]\*  
Address: Japan.

1701. Kashihara, Keiko; Nio, Noriki; Kobota, Kouji. 2001. [Purification and characterization of a protease in commercial natto]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 48(2):134-37. [13 ref. Jap; eng]  
Address: Ajinomoto Co., Inc., Food Research & Development Labs, 1-1, Suzuki-cho, Kawasaki-ku, Kawasaki-shi, Kanagawa prefecture 210-0861, Japan.

1702. Stephens, Roger; Stephens, Jane Ade. ed. and comp. 2001. Soyfoods guide 2001: Helpful tips and information for using soyfoods. Indianapolis, Indiana: Stevens & Associates, Inc. Distributed by the Soy Protein Partners. 24 p. Illust. No index. 28 cm. [23 ref]

• **Summary:** This guide is available only on a limited basis to dietitians and health professionals. Contents: Foreword. Keep your heart healthy: Super soy protein smoothie. Beans, beans, good for the heart: The more you eat, the better your chances of lowering your blood cholesterol levels. Cholesterol: What's in a claim. Sample soy meal planner (4 meals a day for 5 days, to get 25+ grams/day of soy protein). Dietary guidelines for Americans. Composition of soyfoods (table). The healthy bean: Isoflavones, heart disease, menopause and osteoporosis, allergies, diabetes and kidney disease, fat. Isoflavone content of soyfoods (table). The state of soy research. Protein content of soyfoods (table). Soy resources: Web sites, books. Soyfood substitution chart. Descriptions of soyfoods: Traditional soyfoods, soy-based products, soy ingredients. Recipes: Meat alternatives. Textured soy protein. Soy flour. Whole soybeans. Soymilk. Tofu. Soy snacks and smoothies. Soy—Good for your heart.

The Foreword (p. 2) states: “The 2001 Soyfoods Guide is distributed by the Soy Protein Partners. Partners include state soybean boards from: Alabama, Arkansas, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Maryland, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Jersey, North Carolina, South Dakota, Tennessee, Texas, Virginia, and Wisconsin. Industry partners include: American

Soybean Association, Archer Daniels Midland Company, Central Soya Co., Minnesota Soyfoods Association, Protein Technologies International, Soy Protein Council, Soyfoods Association of North America, Soyfoods Council and the United Soybean Board.” Address: 4816 North Pennsylvania Street, Indianapolis, Indiana 46205. Phone: 317-926-6272.

1703. Kaneki, M.; Hodges, S.J.; Hosoi, T.; Fujiwara, S.; et al. 2001. Japanese fermented soybean food as the major determinant of the large geographic difference in circulating levels of vitamin K2: possible implications for hip-fracture risk. *Nutrition* 17(4):315-21. April. [Eng]

• **Summary:** “Increasing evidence indicates a significant role for vitamin K in bone metabolism and osteoporosis. In this study, we found a large geographic difference in serum vitamin K2 (menaquinone-7; MK-7) levels in postmenopausal women.

“Serum MK-7 concentrations were 5.26 +/- 6.13 ng/mL (mean +/- SD) in Japanese women in Tokyo, 1.22 +/- 1.85 in Japanese women in Hiroshima, and 0.37 +/- 0.20 in British women. We investigated the effect of Japanese fermented soybean food, natto, on serum vitamin K levels. Natto contains a large amount of MK-7 and is eaten frequently in eastern (Tokyo) but seldom in western (Hiroshima) Japan. Serum concentrations of MK-7 were significantly higher in frequent natto eaters, and natto intake resulted in a marked, sustained increase in serum MK-7 concentration.

“We analyzed the relation between the regional difference in natto intake and fracture incidence. A statistically significant inverse correlation was found between incidence of hip fractures in women and natto consumption in each prefecture throughout Japan. These findings indicate that the large geographic difference in MK-7 levels may be ascribed, at least in part, to natto intake and suggest the possibility that higher MK-7 level resulting from natto consumption may contribute to the relatively lower fracture risk in Japanese women.”

Note 1. There are two K vitamins: K1 and K2. K1 has been much more widely studied than K2. The most concentrated sources of K1 are fruits and vegetables (in micrograms per 100 gm): Kale 817. Spinach 387. Broccoli 156. Green peas 36. Natto 34.7.

Note 2. This is the earliest document seen (Jan. 2012) that focuses on the nutritional significance of the high concentration of vitamin K in natto. Address: Department of Geriatric Medicine, University of Tokyo Graduate School of Medicine, Tokyo, Japan.

1704. Muramatsu, Kanako; Katsumata, R.; Watanabe, S.; Tanaka, T.; Kiuchi, K.; 2001. Itohiki nattô seisan-hô no kairyô [Improvements in the process for manufacturing itohiki natto]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 48(4):277-86. [23 ref. Jap; eng]

Address: 1-2. Faculty of Home Economics, Kyoritsu Women's Univ., 2-2-1 Hitotsubashi, Chiyoda-ku, Tokyo 101-8433, Japan.

1705. Muramatsu, Kanako; Katsumata, Rie; Watanabe, Sugio; Tanaka, Tadayoshi; Kiuchi, K.; 2001. [Development of a low-flavored natto manufactured with leucine requiring mutants of elastase-producing natto *Bacillus*]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 48(4):287-98. [26 ref. Jap; eng]

Address: 1-2. Faculty of Home Economics, Kyoritsu Women's Univ., 2-2-1 Hitotsubashi, Chiyoda-ku, Tokyo 101-8433, Japan.

1706. Sumi, Hiroyuki. 2001. Shinkin kôsoku, nôkôsoku, boke ni genkitek ni kiku nattôkinaze: nattô ga umidasu kyô ni kessen yôkai pawaa [Nattokinase works dramatically for heart attack, stroke, and senility: Amazing thrombus-solving power has been produced by natto]. Tokyo: Yuraku Shuppansha. 190 p. 19 cm. [Jap]

Address: Japan.

1707. Maeda, Hiroshi; Mizutani, Osamu; Yamagata, Y.; Ichishima, E.; Nakajima, T. 2001. Alkaline-resistance model of subtilisin ALP I, a novel alkaline subtilisin. *J. of Biochemistry (Tokyo)* 129(5):675-82. May. [39 ref]

• **Summary:** The alkaline-resistance mechanism of the various alkaline-stable enzymes is not yet known. To clarify the mechanism of alkaline-resistance of alkaline subtilisin, structural changes of two typical subtilisins, subtilisin ALP I (ALP I) and subtilisin Sendai (Sendai), were studied by means of physicochemical methods. Conclusion: Alkaline resistance is closely related to the surface structure of the enzyme molecule. Address: Laboratory of Molecular Enzymology, Division of Life Science, Graduate School of Agricultural Science, Tohoku University, Tsutsumidori Amamiyama, Aoba-ku, Sendai 981-8555, Japan.

1708. Shurtleff, William; Aoyagi, Akiko. 2001. The book of tofu. 2nd ed. Revised. Berkeley, California: Ten Speed Press. 336 p. May. Illust. by Akiko Aoyagi Shurtleff. Index. 28 cm. [321 ref]

• **Summary:** This edition contains an updated "Appendix B-Directory of Tofu Makers" (p. 313-316, updated to 22 Feb. 2001). The copyright page and inside rear cover have also been updated. The preface has been expanded. Numerous other small changes have been made throughout the book. Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 925-283-2991.

1709. Sakyi-Dawson, E.O.; Nartey, N.N.; Amoa-Awuah, W.K. 2001. Feasibility of the use of starter cultures in the production of soydawadawa [soy dawadawa] (Abstract).

Abstract of presentation, IFT Annual Meeting, June 23-27. [http://ift.confex.com/ift/2001/techprogram/paper\\_8633.htm](http://ift.confex.com/ift/2001/techprogram/paper_8633.htm).

• **Summary:** Dawadawa is a food condiment produced by the spontaneous alkaline fermentation of the seeds of the African locust bean (*Parkia biglobosa*) or soybeans (*Glycine max*). It is commonly utilized in West Africa for flavoring soups and stews. Dawadawa contributes significantly to the intake of protein, essential fatty acids and B-group vitamins and is a good source of lysine, which is limiting in cereal foods. Making available hygienically processed dawadawa of consistently high quality will encourage its use. Use of starter cultures is one way of achieving this.

"The objective was to identify and select microorganisms for use in a starter culture for the production of soydawadawa of good consistent quality.

"Forty-one *Bacillus* cultures, which had been isolated from spontaneously fermented soydawadawa, were screened for their proteolytic and amylolytic activities as well as for their ability to grow on soy agar. Twelve isolates that showed high proteolytic activity, amylolytic activity, rapid increase in pH, good growth on soybean agar and fast growth when inoculated in sterile soybeans were selected for development into starter cultures. From the initial twelve isolates used to prepare soydawadawa, four *Bacillus subtilis* isolates were selected based on the results of preliminary sensory analysis. These were then used to produce soydawadawa (S1, S2, S3 and S4) for further chemical and sensory studies.

"Differences in proteinase and amylase activities of S1, S2, S3, S4 and spontaneously fermented beans (SPT) were not statistically significant. Total free amino acid content was highest in the soydawadawa produced with starter cultures. Based on texture, colour and aroma, overall preference was in the order SPT > S1 > S4 > S3 > S2. There were no significant differences in the preference for the flavor of soups flavored with SPT, S1 and S4. The preference for the taste was in the order S1 > SPT > S4.

"Soydawadawa of acceptable sensory characteristics can be produced using starter cultures."

Note the high ranking on both rankings of SPT = spontaneously fermented beans! Address: 1. Dep. of Nutrition and Food Science, Univ. of Ghana, P. O. Box LG134, Legon; 2. Food Research Inst., Council for Scientific and Industrial Research, P. O. Box M20, Accra. All: Ghana.

1710. Mertz, Ole; Lykke, A.M.; Reenberg, Anette. 2001. Importance and seasonality of vegetable consumption and marketing in Burkina Faso. *Economic Botany* 55(2):276-89. April/June. [33 ref]

• **Summary:** As a table shows (p. 280), their survey found that in two villages in Burkina Faso, dawadawa was consumed in 78% and 85% of all meals. Address: 1. Inst. of Geography, Univ. of Copenhagen, Oster, Volgade 10, 1350 Copenhagen K, Denmark.

1711. Urano, Tetsumei; Hayato, I.; Umemura, K.; Suzuki, Y.; Oike, M.; Akita, S.; Tsukamoto, Y.; Suzuki, I.; Takada, A. 2001. The profibrinolytic enzyme subtilisin NAT purified by *Bacillus subtilis* cleaves and inactivates plasminogen activator inhibitor Type 1. *J. of Biological Chemistry* 276(27):24690-96. July 6. [43 ref]

• **Summary:** Subtilisin NAT (formerly designated BSP, or nattokinase) is a profibrinolytic serine proteinase from *Bacillus subtilis*, the bacterium used in the natto fermentation. Address: 1-2. Dep. of Physiology, Hamamatsu Univ. School of Medicine, 3600, Handa-cho, Hamamatsu, 431-3192, Japan.

1712. Dillman, Erika. 2001. The little soy book. New York, NY: Time Warner. xiii + 190 p. Index. 15 x 16 cm. [58 ref]

• **Summary:** Contents: Introduction. 1. It's soy time. 2. Why eat soy? Health benefits of soy? Soy foods: Soy milk, soybean oil, soy sauce, soy meat alternatives, tofu, tempeh, miso, whole soybeans, edamame, soy nuts, soy nut butter, soy sprouts, soy ice cream, soy yogurt, soy cheese, soy flour and grits, textured soy protein (TSP), soy protein concentrate, soy protein isolate, hydrolyzed vegetable protein, infant formula, lecithin, natto, yuba, soy fiber, Cooking with soy (recipes). Notes [references]. Resources [Directory]. Glossary. Address: Seattle, Washington.

1713. Jacobi, Dana. 2001. Amazing soy: A complete guide to buying and cooking this nutritional powerhouse, with 240 recipes. New York, NY: William Morrow. An imprint of HarperCollins Publishers. xiv + 364 p. Aug. Index. 24 cm. [50 ref]

• **Summary:** Contents: Introduction. Ingredients and techniques. Breakfast. Smoothies and drinks. Dips and starters. Soups and breads. Salads and dressings. Wraps, burgers, and savory pies. Pizzas and pastas. Stews, casseroles, and chilis. Steaks, chops, skewers, and meat loaf. Stir-fries and curries. Seafood. Mainly vegetables. Desserts. Sources. Bibliography. Address: Food writer, New York, NY.

1714. Shurtleff, William; Aoyagi, Akiko. 2001. The book of miso: Savory, high-protein seasoning. 2nd ed. Revised. Berkeley, California: Ten Speed Press. 278 p. Illust. by Akiko Aoyagi Shurtleff. Index. Aug. 28 cm. [223 ref]

• **Summary:** This revision has completely new front and rear covers, designed and illustrated by Akiko. It contains a completely new "Appendix D—Miso Manufacturers in the West" (p. 255, updated to 10 May 2001). The page "About the Authors" (autobiographical) has been updated, and the original photographs have been replaced with more recent ones—reflecting the fact that Bill and Akiko separated in Nov. 1993 and their marriage ended in May 1995.

The last page, "Soyfoods Center," has been updated.

The inside rear cover has been updated, and now includes current information about: (1) *Miso Production*, a

book published by Soyfoods Center about how to start and run a company making miso on any of various scales and budgets. (2) *Miso and Soybean Chiang: Bibliography and Sourcebook*, published by Soyfoods Center. (3) SoyaScan, the unique computerized database produced by Soyfoods Center. This database now contains more than 62,000 records from 1100 B.C. to the present, and more than 76% of all records have a summary / abstract averaging 146 words in length. A description of the four different types of records (published documents, commercial soy products, original interviews and overviews, and unpublished archival documents), and the number of each type, is given.

The title page, copyright page, and table of contents have been redesigned and updated to give the book a much more contemporary look. Other small changes have been made throughout the book. Still contains 130 vegetarian recipes—both western and Indonesian.

Ten Speed Press gave this book a new ISBN: 1-58008-336-6. Yet despite the many changes described above, the authors preferred not to have this called a "new edition" or "revised edition." Address: Soyfoods Center, P.O. Box 234, Lafayette, California 94549. Phone: 925-283-2991.

1715. Shrestha, Ashok K.; Noomhorm, Ataphol. 2001. Composition and functional properties of fermented soybean flour (*kinema*). *J. of Food Science and Technology (Mysore)* 38(5):467-70. Sept/Oct. [29 ref]\*

Address: Univ. of New South Wales, Dep. of Food Science and Technology. Cydney, NSW 2052, Australia.

1716. Weed, Susun S. 2001. New menopausal years: The wise woman way. Woodstock, New York: Ash Tree Publishing. xxiii + 280 p. Dec. Illust. Index. 22 cm. [102\* ref]

• **Summary:** Soy is discussed throughout this book but sources are rarely cited. When they are cited, we insert them below. For heavy bleeding (flooding) during the menopausal years: To nourish and tonify, avoid tofu, soy drinks, and soy protein powders (p. 9-10). For uterine fibroids: Consume lignans, which are anti-estrogenic phytoestrogens, found in all whole grains and beans—including soy (p. 15). Building better bones: Exercise regularly, eat calcium-rich foods, and avoid calcium-leaching foods such as soy "milk," tofu, coffee, alcohol, and white flour products (p. 24). Calcium: Caution—"Unfermented soy (e.g. tofu) is especially detrimental to bone health being protein-rich, naturally deficient in calcium, and a calcium antagonist to boot (p. 28). Beware of calcium antagonists, foods that interfere with calcium utilization. Avoid consistent use of unfermented soy products, including tofu, soy beverages, and soy burgers (p. 29; see p. 163).

Phytosterolic, phytoestrogenic foods: Whole grains and beans are good sources. "Caution: Beans must be cooked or fermented to remove anti-nutritional substances. Tofu and

soy 'milk' are not recommended" (p. 70).

Red clover has ten times more phytoestrogens than soy, as well as much more bone-building minerals, such as calcium and magnesium (p. 71). Sea vegetables are second only to flax in concentration of lignans. Seaweeds, not soy, are the real secret of health in the Japanese diet (p. 72). "The phytoestrogens in dong quai, like those in soy, promote the growth of cancer cells in petri dishes" (p. 73). Phytoestrogenic herbs: Fermented soy products (miso, tamari, tempeh), ground flax seeds, whole grains, etc. are rich in hormonal precursors and phytoestrogens. Use daily to ease menopausal symptoms, prevent cancer, and lower heart disease risk (p. 94). Lack of vitamin B-12 doubles the risk of severe depression for older women; tofu and soy beverages interfere with its absorption (Fallon 1999) (p. 114).

Preventing breast cancer: 75% of all breast cancers occur in women over age 50. Reduce use of seed oils, such as soy oil. For each 5 gm of polyunsaturated fat (from vegetable oils), risk of breast cancer rose by 70% (Wolk 1997 [sic, 1998]) (p. 145). Eat more beans: "There is a relationship between the large amount of *fermented* soy products (miso and tamari) in the Japanese diet and low incidence of breast cancer. But no relationship has ever been shown between the consumption of processed, fake, imitation soy foods, and breast cancer reduction. Soy beverage is used moderately, or not at all, depending on the specific Asian country" (p. 146).

Herbal allies: Red clover is everything you thought soy would be with none of soy's drawbacks. It contributes to bone health, normalizes the thyroid, and prevents and counters breast cancer. "So do miso and tamari, but not other soy foods. Red clover contains more active phytoestrogens in greater quantity than soy... Red clover contains all four of the major estrogenic isoflavones; soy has only two of them. A cup of red clover infusion (not tea) contains ten times more phytoestrogens than a cup of soy beverage, is richer in calcium, has less calories, and contains no added sugars" (p. 161).

The section titled "Soy" (p. 163-64) praises fermented soy foods (miso, tamari, tempeh, natto) but is quite critical of tofu, soy milk, and "fake soy foods" (burgers, hot dogs, soy cheese, etc.). Soy can reduce hot flashes and prevent heart disease; fermented soy foods can protect against breast cancer. Soy is not a good source of calcium and it is deficient in fats needed for healthy brain/memory functioning. "Soy protein isolate, textured vegetable protein, isolated isoflavones-processed soy foods come in more forms than I can list. I eat miso and tamari freely, tofu and tempeh occasionally, and other soy products not at all. Dosage: 50-200 grams of isoflavones per day, preferably from food. Caution: Excess soy can cause liver damage and is said to feminize men. Soy may be difficult to digest, may cause allergic reactions."

Interstitial cystitis: Tofu may cause problems (Ford 1999).

Heart healthy: Soy, whole grains, vitamin E (from foods), essential fatty acids, and seaweeds are helpful (p. 210).

Osteoporosis risk factors: Being a vegetarian or vegan who eats a lot of tofu or soy beverage (p. 218). "Eliminate soy products except tamari and miso. (Unfermented soy prevents you from utilizing calcium.)" (p. 220).

Aching joints: A tofu poultice may help (p. 229).

Vitamins and minerals for the menopausal years: Vitamin B-12, calcium, and iron are depleted by unfermented soy products (p. 248, 250-51).

Note: The author does not cite a single scientific publication to support her many criticisms of soyfoods. In fact, the scientific literature does not support her criticisms. It is well known that the author is an admirer of Sally Fallon. Address: P.O. Box 64, Woodstock, New York 12498-0064.

1717. Beumer, R.R. 2001. Microbiological hazards and their control. In: Martin R. Adams and M.J. Robert Nout, eds. 2001. *Fermentation and Food Safety*. Gaithersburg, Maryland: Aspen Publishers. xi + 290 p. See p. 141-57. Illust. 26 cm. [Jap]\*

• **Summary:** There has never been an outbreak of illness associated with the consumption of *Bacillus subtilis* in fermented foods (such as natto).

1718. Kiuchi, Kan. 2001. Miso and natto. *Food Culture (Kikkoman Inst. for International Food Culture, Noda, Japan)* No. 3. p. 7-10. <http://kiife.kikkoman.co.jp>. [6 ref. Eng]

• **Summary:** This article makes several statements that, to us, seem very surprising: (1) "Both *miso* (soybean paste) and *natto* (fermented soybeans) are said to have originated in China, but once introduced into Japan they inspired the development of a variety of unique local soybean based products" (p. 7).

Note 1. We believe that *itohiki-natto*, whose main fermentation organism is *Bacillus subtilis* and which is unsalted, originated in Japan, and that *douchi* (fermented black soybeans), whose main fermentation organism is a mold and which is salted, originated in China, long before *itohiki-natto* is thought to have originated in Japan.

(2) "Whole soybeans are used to make *natto*, and because only a single variety of *natto* mold is used in the fermentation process, the beans retain the original shape" (p. 7).

Note 2. Natto (i.e., *itohiki-natto*) is not made with a mold; it is made with a bacterium.

(3) *Natto* is thought to have originated in China's Yunnan province, although legend has it that *itohiki-natto* (hereinafter simply called "natto") was invented by accident in Japan's Tohoku region in the eleventh century when boiled beans that were going bad were eaten and found to be rather tasty.

“The two main varieties of *natto* are *itohiki-natto* and *shiokara-natto*, which is also known as *tera-natto* and includes *daitokuji-natto* from Kyoto and *hama-natto* from Hamamatsu. A bean koji is made using koji mold” (p. 9).

Note 3. We believe that the statement “*Natto* is thought to have originated in China’s Yunnan province,...” is very confusing, and that confusion is based on the fact that in Japanese, two completely different and unrelated fermented soyfoods are both referred to as “*natto*.” We would say instead: *Natto* (i.e., *itohiki-natto*) originated in Japan and *douchi* (called *shiokara-natto* in Japan) originated in China. Address: Ph.D., Prof., Dep. of Food Science and Nutrition, Kyoritsu Women’s Univ., Japan.

1719. Tamang, Jyoti Prakash. 2001. Kinema. *Food Culture (Kikkoman Inst. for International Food Culture, Noda, Japan)* No. 3. p. 11-14. <http://kiifc.kikkoman.co.jp>. [7 ref. Eng]

• **Summary:** Contents: Introduction. Hypothesis of the origin of kinema. Methods of preparation. Kinema dishes. Socio-economic factors. Microbiology and nutritive value of kinema. Transition in food culture.

“The common word kinema is derived from ‘kinambaa’ of the Limboo dialect (Limboo, being one of the major ethnic communities of Nepalis), ‘ki’ means fermented and ‘nambaa’ means flavor. The kingdom of ‘Limbuwan’ (presently the eastern Nepal districts of Therathum, Taplejung, Panchthar, Dhankuta, and Ilam) was established by the Limboo earlier than the seventh century and remained independent till the unification of Nepal in the seventeenth century. Though there is no historical document on the origin of kinema, it is certain that among the Nepalis, the Limboo started production and consumption of this unique fermented flavorful soybean food.”

A flow chart shows the traditional method of kinema production practiced in Sikkim—starting with 100 gm dry soybeans. Clean and wash. Soak in water overnight. Drain excess water. Add clean water. Boil. Drain excess water. Crack lightly in a wooden mortar with a wooden pestle. Sprinkle with wood ash (up to 1% by weight). Wrap in fern leaves and keep in a bamboo basket, covered. Allow to ferment at 25-45°C for 2-3 days. Result: About 230 gm kinema.

Photos show: (1) A plate of kinema. (2) A woman pounding cooked soybeans with a heavy, 4-foot-long pestle in a large wooden mortar (14 inches wide by 18 inches high). (3) The woman adding firewood ash to the pounded soybeans in the mortar. (4) The cooked soybean grits are placed in fern leaves prior to wrapping and fermentation. (5) Wrapped in fern leaves, the grits are kept in a bamboo basket, covered with a jute bag. (6) Kinema curry served in a side dish next to a plate of the ingredients.

(7) Jyoti Prakash Tamang, Ph.D., born in Darjeeling, India, in 1961.



The most common recipe for kinema curry is given. Heat vegetable oil in a frying pan and add 1 chopped onion and fry until it becomes tender. Add 1 sliced tomato and ¼ tablespoon turmeric powder; fry for two minutes. Add 250 gm fresh kinema, 1 teaspoon salt, and 3 sliced green chilies; fry for three to five minutes. Pour in a little water to make a thick curry, and cook for 5-7 minutes more. Kinema curry is now ready for serving with boiled rice.

A map shows kinema diversity in the Eastern Himalayan regions. It is called “kinema in eastern Nepal, the Darjeeling hills, Sikkim and Bhutan, aakhuni in Nagaland, hawajar in Manipur, turangbai in Meghalaya, and bekanthu in Mizoram... These fermented soybean foods are similar to the *natto* of Japan, *chungkok-jang* of Korea, *thua-nao* of northern Thailand and *pe-poke* of Myanmar.”

Note 1. This is the earliest document seen (Jan. 2012) that mentions “aakkhuni,” a close relative of Nepalese kinema and Japanese *natto*.

Note 2. This is the earliest document seen (Jan. 2012) that mentions “bekanthu,” a close relative of Nepalese kinema and Japanese *natto*.

Note 3. This is the earliest document seen (Jan. 2012) that mentions “turangbai,” a close relative of Nepalese kinema and Japanese *natto* from Meghalaya.

Note 4. This is the earliest document seen (Jan. 2012) that uses the alternative spelling “pe-poke” to refer to pepok, a close relative of Nepalese kinema and Japanese *natto* from Myanmar.

Note 5. This is the earliest English-language document seen (Jan. 2012) that uses the alternative spelling “chungkok-jang” to refer to Korean *natto*. Address: Ph.D., Professor,

Sikkim Government College / Director, Darjeeling Centre for Traditional Food Research.

1720. Tamang, Jyoti Prakash. 2001. Food culture in the Eastern Himalayas. *Himalayan and Central Asian Studies: J. of Himalayan Research and Cultural Foundation (New Delhi)* 5(3-4):107-18. [6 ref]

• **Summary:** Fermented soybean foods are made and consumed in the eastern Himalayas and its adjoining foothills. They include kinema, which is prepared in eastern Nepal, the Darjeeling hills, Sikkim, and Bhutan. Close relatives of kinema are *aakhumi* in Nagaland, *hawaijar* in Manipur, *turangbai* in Meghalaya, *bekanthu* in Mizoram, and *pe-poke* in Myanmar.

Table 1, “Ethnic fermented foods of the Eastern Himalayas and its adjoining foot-hills,” gives details about each of these foods: Food name, substrate, nature and use, region of use.

Table 2 shows that a non-fermented food consumed by Nepalis is *Vatamas ko achar*, a seasoning whose main ingredient is ground roasted soybeans.

Consumption of fermented soyfoods is uncommon in the Western and Hindu-Kush Himalayas, and even in other parts of India. These fermented soyfoods are similar to *natto* of Japan, *thua-nao* of northern Thailand, and *chungkok-jang* of Korea. Address: Food Microbiology Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1721. Hayter, Kurumi. 2001. The soy for health cookbook: Recipes with style and taste. Alexandria, Virginia: Time-Life Books. 144 p. Illust. (color). Index. 25 x 19 cm.

• **Summary:** This is a beautiful and strange book, designed and produced by Quintet Publishing Ltd. (London). Beautiful in that almost every other page is a stylish full-color photo of a recipe. Strange in that: (1) Tofu is probably the most common soy ingredient used, yet it does not even appear in the index. Nor does tempeh which is also called for. Yet miso is in the index. (2) A number of the soyfood terms are bizarre and unconventional—such as “beancurd pouches” [abura-age or deep-fried tofu pouches], “sticky beans (natto).” (3) On the inside front cover, the book’s title is given as “The Tofu for Health Cookbook.”

Contents: Introduction: Nutrition and health, lactose (dairy intolerance), prevention against heart disease, prevention against cancer, prevention of other disorders. How to use this book. Glossary of soyfoods and other ingredients. Basic recipes. 1. Soups and stews. 2. Salads and appetizers. 3. Main dishes. 4. Snacks and side dishes. 5. Desserts.

This book is not vegetarian; some recipes call for beef, pork, chicken, fish, etc.—but none call for dairy products.

1722. Ishige, Naomichi. 2001. The history and culture of

Japanese food. London, New York, Bahrain: Kegan Paul. x + 273 p. Illust. Maps. No index. 24 cm. [59 ref. Eng]

• **Summary:** This book is crippled by the lack of an index. Moreover, the sources of most of the interesting material in the text are not cited. Otherwise it is very well researched and well written.

Contents: Introduction—The historical framework. Part I: The dietary history of Japan. 1. The prehistoric era: The Paleolithic age, the advent of earthenware, Jōmon society and dietary culture. 2. Establishment of a rice-growing society: A crop held in special regard, the dissemination and development of rice, rice cooking, sake brewing, fermented fish and flavourings. 3. The formative period of Japanese dietary culture: Historical setting, the taboo on meat eating, the lack of a dairy industry, annual observances and rites of passage, place settings and table settings, cooking and banquet styles, the roles of the monasteries, the popularization of noodles.

4. The age of change: Historical setting, the diffusion of tea, the impact of the ‘Southern Barbarians’ (*nanban*; first came the Portuguese and Spaniards, Catholics from Iberia, then the Dutch and English, Protestants from northwest Europe called *kômōjin* {“redheads”} to distinguish them from the Iberians, Saint Francis Xavier, introduction of meat eating {beef} by Catholics by 1557 in the town of Oita in northwest Kyushu, expansion of meat eating by non-Christians in Nagasaki and Hirado island {northeast Kyushu}, in 1612 Christianity and meat eating are prohibited by the Tokugawa shogunate but the Chinese colony in Nagasaki is exempted, Dutch traders are the only Europeans allowed to remain in Japan after the country is closed but they are isolated on a tiny island in Nagasaki harbor and barred from contact with ordinary citizens, dishes with nanban influence include fried tofu patties {called *ganmodoki* in the east of Japan, or *hirōsu* or *hiryōzu* in the east}, tempura, nanban confectionary {such as *kasutera*} is especially popular, introduction of new crops by Europeans {incl. sweet potato, two types of pumpkin squash, cayenne pepper, kidney beans, peanuts}, formation of a new style (banquet-style meals {honzen ryōri}, kaiseki), change in the frequency of meals (from two to three). 5. The maturing of traditional Japanese cuisine: Historical setting town and country, the spread of soy sauce, the emergence of the restaurant, snack shops, books on cooking and restaurants, the Ainu, the Ryukyu Islanders. 6. Changes in the modern age: Historical setting, the resumption of meat eating, milk and dairy products, entry of foreign foods, zenith and nadir, new meal patterns, integration of foreign foods—a model.

Part II: The dietary culture of the Japanese. 7. At the table: Gohan—framework of the meal, the rise of the table, the tabletop as landscape, chopsticks and table manners, etiquette—as you like it. 8. In the kitchen: The secularization of fire and water, from wood fire to electric rice cooker, the knife—a sword in the kitchen, restaurants—the public kitchen.

9. On the menu: Soup and umami flavouring. Sashimi—Cuisine that isn't cooked, Sushi—from preserved food to fast food, sukiyaki and nabemono, tofu and nattô—meat for vegetarians, vegetarian temple food, tempura and oil, noodles and regional tastes, pickled and preserved seafood, mochi, confectionery and tea, the dynamics of sake and tea.

Teriyaki developed during the Edo / Tokugawa period (1600-1867) (p. 116; However no citation for the source of this information is given).

During the Edo period, most commoners living in Japan's cities ate plain and repetitive meals. In Edo (later Tokyo) most had a breakfast of rice, miso soup, and pickles; for lunch and dinner they ate approximately the same thing "with the addition of one dish of simmered vegetables or tofu, or simmered or grilled fish" (p. 113). Address: National Museum of Ethnology, Osaka, Japan.

1723. Kiuchi, Kan. 2001. [Natto industry and technical innovation]. In: Food System and Food Processing (Food System Series, Vol. 15). Tokyo: Society of Agricultural Statistics. See p. 139-50. [Jap]\*

1724. Matsumoto, Miwa. 2001. Tôfu, nattô [Tofu and natto]. Tokyo: Kin no Hoshi Sha. 47 p. Illust. (color). Index. 30 cm. Series: "Shoko" de Sogo Gakushu Minna de Shirabete Tsukette Tabeyo, no. 4. [Jap]\*

• **Summary:** A children's book. Address: Japan.

1725. Namkoong, Joan. 2001. Go home, cook rice: A guide to buying and cooking the fresh foods of Hawaii. Honolulu, Hawaii: Namkoong Pub. 104 p. Illust. (color photos by Rae Huo). Index. 28 cm. \*

• **Summary:** "A collection of food stories that appeared in the *Honolulu Advertiser* from 1994 to 2001 and information about food products." "Guide to buying and cooking the fresh foods of Hawai'i" (from the publisher).

The section titled "Soy" (p. 67-71) begins with brief definitions of tofu, fresh soybeans [edamame], soy sprouts, miso, natto, and "fermented black beans." Then recipes: Basic miso sauce. Spicy soy beans (with "1 pound soybeans"). Soy bean sprouts (*kong na mul* in Korean). On page 69, more soyfoods are described: Aburage. Fermented bean curd. Fu jook [Dried yuba sticks]. Tempeh. Tofu. Then a recipe for Lemon grass tofu (Vietnamese). Page 71 discusses "Soy bean sauces" such as hoisin, bean sauce, and shoyu (made with koji). Page 72: "The flavors of soy sauces." Chinese soy sauces (tend to be saltier than Japanese shoyu). Tamari. Kecap manis. Light or sodium reduced soy sauces. Dashi soys. How to use soy sauces. Address: Hawaii.

1726. Natsume, Michiko. 2001. Tôfu, nattô, aburage no okazu: Shunka shûtô teiban menyuu [Side dishes made from tofu, natto, and deep-fried tofu pouches: spring, summer, fall, winter, a standard / definitive menu]. Tokyo: Ikeda Shoten.

143 p. 21 cm. [Jap]

Address: Japan.

1727. Singleton, Paul; Sainsbury, Diana. 2001. Dictionary of microbiology and molecular biology. 3rd ed. Chichester, New York, Weinheim, Brisbane, Singapore & Toronto: John Wiley & Sons, Ltd. xi + 895 p. Illust. 25 cm.

• **Summary:** Contains entries for: fermentation, fermented foods, fermenter (fermentor), fungi, miso, natto, ogi, oncom, shoyu (see Soy sauce), soy paste (see Miso), soy sauce (shoyu), sufu, tempeh, tofu (an intermediate in Sufu production). Address: London.

1728. Guo, J.; Sun, Y.; Su, Y. 2002. [Preparation of natto and its function in health care]. *Zhong Yao Cai* 25(1):61-64. Jan. [Chi]\*

• **Summary:** A review of the literature. Address: Dep. of Food Science and Engineering, Neimonggu Agricultural University, Huhhot 010018, Neimonggu Autonomous Region, China.

1729. Greendale, Gail A.; FitzGerald, Gordon; Huang, M.H.; Sternfeld, B.; Gold, E.; Seeman, T.; Sherman, S.; Sowers, M. 2002. Dietary soy isoflavones and bone mineral density: results from the study of women's health across the nation. *American J. of Epidemiology* 155(8):746-54. April 15. [39 ref]

• **Summary:** "Japanese and Chinese women are about half as likely as Caucasian women to experience a hip fracture." Understanding the reasons for this striking difference could lead to new strategies for treating or preventing this condition.

"Isoflavones are naturally occurring selective estrogen receptor modulators, with potential bone protective effects. To study the relation between soy isoflavone intake and bone mineral density (BMD), the authors analyzed baseline data from the Study of Women's Health Across the Nation, a US community-based cohort study of women aged 42-52 years. Their 1996-1997 analysis included African-American (n = 497), Caucasian (n = 1,003), Chinese (n = 200), and Japanese (n = 227) participants." Address: 1. Division of Geriatrics, School of Medicine, University of California, Los Angeles, CA.

1730. Smith, Patricia J. 2002. Macrobiotic Company of America (MCOA, Asheville, North Carolina) is no longer in business. Bruce Macdonald is importing all of Mitoku's products to the USA (Interview). *SoyaScan Notes*. April 19. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Patricia has heard from reliable sources that after MCOA ceased its operations, Norio Kushi left the company. Bruce Macdonald and his daughter, Crystal, both live in Asheville and run Bruce's company.

Patricia recently visited South River Miso Company



where she visited with Christian Elwell, Robin Cole, Megan Calogeras, and Charles Kendall—who is still making natto, amazake, and mochi. Address: Radical Food, P.O. Box 952, Mill Valley, California 94942-0952.

1731. Shrestha, Ashok K.; Noomhorm, Ataphol. 2002. Comparison of physico-chemical properties of biscuits supplemented with soy and kinema flours. *International J. of Food Science & Technology (UK)* 37(4):361-68. April. [30 ref]

• **Summary:** Evaluation of sensory characteristics showed greater acceptance of kinema-supplemented biscuits than of those supplemented with full-fat soy flour. Address: Agricultural and Food Engineering Program, School of Environmental Resources and Development, Asian Inst. of Technology, P.O. Box 4, Klongluang, Pathumthani [Pathum Thani], 12120, Thailand.

1732. Steinkraus, Keith H. 2002. Fermentations in world food processing. *Comprehensive Reviews in World Food Science and Food Safety* 1(1):23-32. April. [96 ref]

• **Summary:** The section titled “Alkaline fermentations” (p. 28) states that highly alkaline fermentations are generally safe. These include *dawadawa* in Nigeria, *soumbara* in the Ivory Coast, and *iru* in West Africa—each made by fermentation of the soaked and cooked seeds of the African locust bean tree (*Parkia biglobosa*). This is a bacterial fermentation; the bacteria belong to the genus *Bacillus*, typically *Bacillus subtilis*. No inoculum is used.

Soybeans can be substituted for the locust beans.

Protein-rich alkaline fermentations also include several based traditionally on soybeans; natto from Japan, thua-nao from northern Thailand, and kinema from Nepal and environs. In each food, the essential microorganism is *Bacillus subtilis* and related bacilli. The enzymes produced are highly proteolytic; the proteins in the substrate are hydrolyzed to peptides and amino acids. Ammonia is released and the pH rapidly rises to 8.0 or higher. The combination of high pH and free ammonia plus the rapid growth of the essential microorganisms at relatively high temperatures (above 40°C) make it difficult for spoilage microorganisms to grow. Therefore the products are quite stable and well-preserved. They are safe to eat even when made in an unhygienic environment.

The section titled “High salt savory flavored amino / peptide sauces and pastes” (p. 28) discusses sauces and pastes including Chinese soy sauce, Japanese shoyu and miso, Indonesian kecap, Korean kanjang, Malaysian kicap, Taiwanese inyu.

“The ancient discovery of how to transform bland vegetable protein into meat-flavored amino acid / peptide sauces and pastes was an outstanding human accomplishment.” Address: Prof. Emeritus, Microbiology and Food Science, Cornell Univ., Ithaca, NY 14853.

1733. *IKWW (Indigenous Knowledge Worldwide)* (Silang, Cavite, Philippines). 2002. Traditional methods for processing locust beans. May. \*

• **Summary:** The process of making dawa-dawa, which may vary slightly by region and among producers, is described as follows using the Yoruba word *iru*.

“The traditional process for producing *iru* begins with the manual removal of the pod’s outer layer. The yellow pulp inside the pod, in which the seed is embedded, is then soaked in water and strained through a sieve or basket to remove the seeds. The clean seeds are boiled in water for about 24 hours to soften the hard seed coat. When the seeds are cool, the seed coats are loosened through abrasion [as by rubbing between the hands]. They float to the top of the water while the clean beans settle to the bottom of the container. The next stage is fermentation. The clean beans are wrapped in leaves or plastic in an air-tight container. This is kept at room temperature for three to seven days depending on the type of *iru* to be produced. Usually charcoal is placed on top to aid fermentation. After fermentation the product is ready to use. For storage, common salt [NaCl] is added and the product is then dried in the sun. The salted, dried *iru* can be kept for months.”

Note: This periodical is published by the International Institute of Rural Reconstruction in an area directly south of Manila, Philippines. Address: Philippines.

1734. Liu, B.Y.; Song, H.Y. 2002. [Molecular cloning and expression of Nattokinase gene in *Bacillus subtilis*]. *Sheng Wu Hua Xue Yu Sheng Wu Wu Li Xue Bao (Shanghai)* 34(3):338-40. May. [Chi]\*

• **Summary:** In order to characterize biochemically the enzyme nattokinase, the nucleotide sequence of the nattokinase gene was amplified from the chromosomal DNA of *B. subtilis* (natto) by polymerase chain reaction (PCR). The expression plasmid pBL NK was constructed and was used to transform *Bacillus subtilis* containing a chromosomal deletion in its subtilisin gene. Address: Dep. of Molecular Genetics, School of Medicine, Fudan University, Shanghai 200032, China.

1735. Corcoran, David. 2002. Restaurants: The sushi belt. A Japanese restaurant is reborn as it installs automated service. *New York Times*. June 9. p. NJ20.

• **Summary:** This is another review of East Japanese Restaurant (1405 Teaneck Rd., Teaneck, New Jersey). East has installed a kaiten-zushi revolving conveyor belt that carries pieces of sushi around the sushi bar. On it the “chefs continually place little plates of fresh sushi, to which the diners help themselves. The color of the plate indicates the price; at the end of the meal the waiter adds it all up.”

The idea was invented in Osaka in the late 1950s; it has transformed this sushi bar from a calm, relaxed, mediocre

place to one that “throbs with hyperkinetic urban intensity” and an “impulse-buying spirit.”

“That bean-and-scallion roll on the white dish, driving up on the left? Go for it! It’s only a dollar. It turns out to be a natto roll: sticky soybeans that leave a viscous trail when you pick them up; they are bland, chewy and faintly bittersweet.

“In truth, I’d place natto roll in the ‘interesting’ category. I’m glad I tried it, but I didn’t feel I needed to finish it.” As the carousel turns.

1736. Sarkar, P.K.; Hasenack, B.; Nout, M.J.R. 2002. Diversity and functionality of *Bacillus* and related genera isolated from spontaneously fermented soybeans (Indian *kinema*) and locust beans (African *soumbala*). *International J. of Food Microbiology* 77(3):175-86. Aug. 25. Address: Dep. of Agrotechnology and Food Sciences, Wageningen Univ., Bomenweg 2, 6703 HD, Wageningen, The Netherlands.

1737. Arnold, Chris. 2002. The Scoular Company (Portfolio). Omaha, Nebraska. Four inserts. 28 cm.

• **Summary:** The inserts are: (1) Cover letter, typed with signature on letterhead. Scoular’s IP food grain division is comprised primarily of five people, incl. Greg Lickteig and Chris. Greg is the senior manager of the group with 10-12 years of experience in the IP food grade industry. Their main focus is IP soybeans. Scoular works with several private and public seed varieties to provide its customers with a wide selection of soybean varieties, with uses ranging from tofu, soymilk, miso, natto, and textured soy products. IP and Non-GMO certificates are provided upon demand to customers. Scoular’s annual volume is about 45,000 metric tons/year of food soybeans; 80% of these are exported to Asia, and the remaining 20% are consumed in the USA. Scoular is QAI, OCIA, and JAS certified. Web: [www.scoular.com](http://www.scoular.com).

(2) Twelve pages from the company’s website. Contents: Welcome to The Scoular Company. Markets: Introduction, producer markets division, processor markets division, flourmill markets division, industrial markets division. Special company capabilities: Foreign subsidiaries (Scoular Canada, Scoular de Mexico, risk management services, alliance & partnership opportunities). Locations: Regional map of North America, incl. Canada and Mexico.

(3) Company history (3 p. card): “For 110 years The Scoular Company has been serving people in Agriculture. It is our past, our present, and our future.” 1892—A grain and lumber company was founded by George Scoular in Superior, Nebraska. 1927—George Scoular Grain & Lumber Company was incorporated in Nebraska and Missouri. 1967—A group of grain industry executives headed by Marshall Faith led the company into a new era. These “Young Turks” were hired by Bob Scoular, the new chairman of the board. 1985—The company diversified from grain warehousing to merchandising and distribution. 1998—The Company

acquired International Protein Corporation and Industrial Food Ingredients. 2000—The company restructured to address specific market segments.

(4) Issue of *Scoular Connections* newsletter on company history (2002 vol. 7, no. 2). “Scoular celebrates 110 years of serving people in agriculture.” 1898—George Scoular invites Dennis Bishop to become his partner. 1926—Bob Scoular was a traveling salesman. 1930—George Scoular died. That year over half of all farms had cars, about a third had telephones, and a little over 10% had electricity. 1954. George Scoular’s widow and her two sons bought out the Bishop family interest. That year just over 70% of all farms had cars, a little less than 50% had telephones, and 93% had electricity. 1979—The Young Turks were successful. The company had sprouted in 12 years from a “ramshackle three-elevator operation into a flourishing Nebraska giant of grain, operating 27 elevators and terminals and merchandising 70 to 80 million bushels of corn, wheat, milo, soybeans, and oats each year to buyers all over the world.” At the helm was Marshall Faith. Address: 2027 Dodge St., Omaha, Nebraska 68102. Phone: 1-800-488-3500.

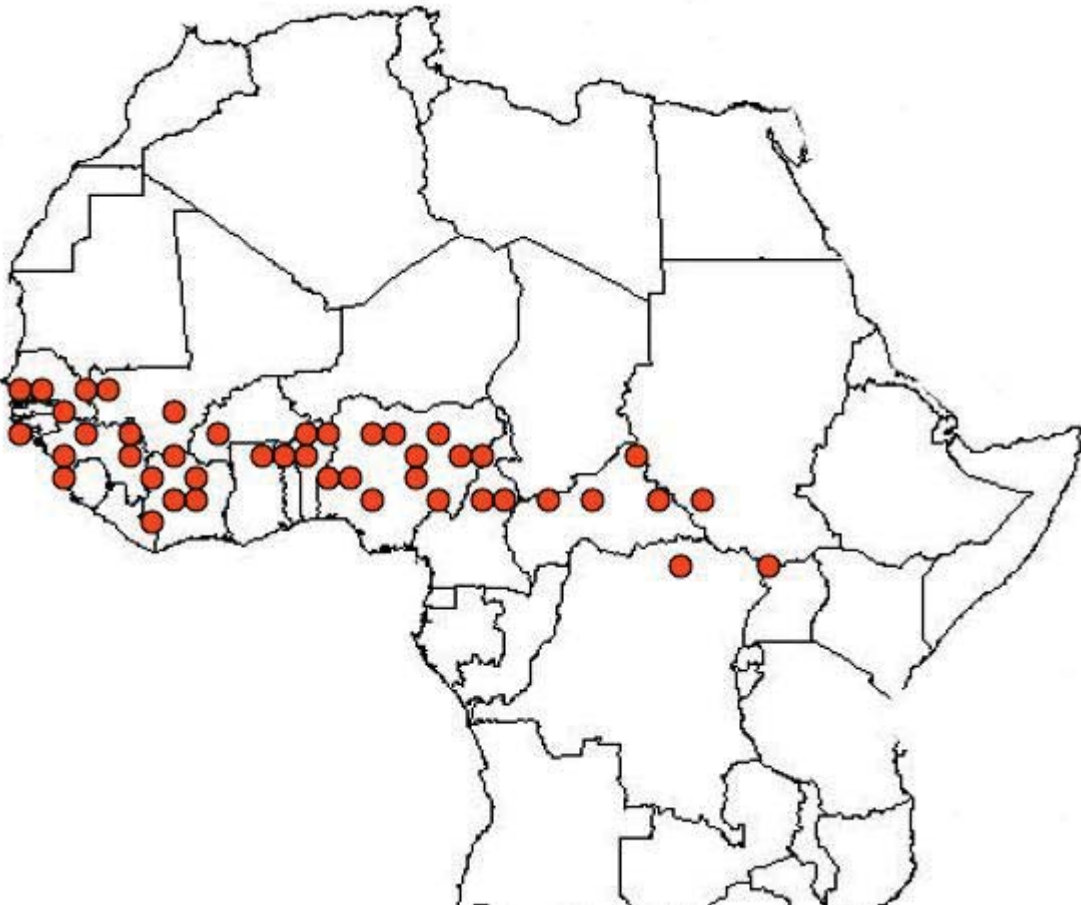
1738. Tamang, Jyoti Prakash. 2002. Lesser-known ethnic fermented soybean foods of the eastern Himalayas. In: K. Liu, et al., eds. 2002. Proceedings China & International Conference & Exhibition on Soybean Technology & Development Cooperation (CISCE) 2002 [Extended abstracts]. Beijing, China: Chinese Cereals and Oil Association (CCOA). [7] + 474 p. See p. 232-33. Held 6-9 Nov. 2002, Beijing, China. [Eng]

• **Summary:** The food culture of the people of the Eastern Himalayas is somewhere between the food culture of East Asia and the food culture of Southeast Asia. Soybean is a leguminous summer crop, which has been used for centuries to prepare both fermented and non-fermented foods in the Eastern Himalayan regions of Nepal, India, and Bhutan. The fermented foods prepared in this region are *kinema*, *aakhuni*, *hawaijar*, *turangbai*, and *bekanthu*. These fermented soyfoods are similar to natto of Japan, *thua-nao* of northern Thailand, *douchi* of China [sic], *chungkok-jang* of Korea, and *pe-poke* of Myanmar. All of the above foods have a bacterium, *Bacillus subtilis* as their dominant organism.

A detailed discussion of kinema, its history and its microorganisms, is given, Address: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1739. Shao, Margaret. 2002. *Parkia biglobosa*: Changes in resource allocation in Kandiga, Ghana. Master’s thesis, Michigan Technical University. vi + 106 p. <http://forest.mtu.edu/pcforestry/people/1998/shao.pdf> [72 ref]

• **Summary:** Contents includes: 1. Introduction. 2. Background.... 5. *Parkia biglobosa*: Botany, traditional uses, process of dawadawa preparation, microbiology and



fermentation, natural regeneration [of the trees] (p. 44-78). 6. Soybeans (p. 79-82). 7. Results and discussion. 8. Conclusion. 9. Literature citations. 10. Appendix.

“In 1757, Michel Adanson first recorded *Parkia biglobosa* during his collecting trips to Senegal and Gambia. Although Adanson did not name the tree, in 1763 Nicolaus Jacquin formally published the valid binomial name *Mimosa biglobosa*.” In 1826 Robert Brown suggested renaming the genus *Parkia* to commemorate Mungo Park, a Scottish surgeon who explored western Africa in the 1790s, following the course of the Niger River (p. 44). *Parkia biglobosa* is a leguminous tree. A photo (p. 45) shows the tree. Bats are the primary pollinators of this tree. “The fruit or seedpod is the most widely used and economically important part of the tree... In Feb. or March the pods, when green, fleshy, and pliable are sometimes eaten by humans after roasting the pods over embers” (p. 48, 52). Baboons, chimpanzees and other primates also feast on the immature pods—thus competing with humans.

A map (p. 52) shows the distribution of *Parkia biglobosa* trees in Africa (adapted from Hall et al. 1997); it is found in 19 African countries.

“In March and April, the beginning of ‘hunger season’ when other foods are becoming scarce, mature pods are

collected for food. The seeds are used in preparation of dawadawa, a protein and fat rich food.

This tree has many important medical uses. “The name of the tree and the food product, dawadawa is from Hausa, the lingua franca of West Africa spoken by over” 50 million people in western Africa. Hausa borrowed many words from Arabic, and these greatly influenced its vocabulary. In Swahili, also a language of Arabic origin, *dawa* refers to any medicament supplied by a doctor. A decoction of the seeds, pounded with salt and fermented is used to treat tension, mouth ulcers, skin infections, and wasp or bee stings.

The process of making dawadawa from locust bean seeds in Kandiga, Ghana, is described (p. 58-65) and a flow chart appears on p. 63. “A more recent processing method is to add fermented soybeans as a filler, increasing the volume, diluting but not losing the preferred taste of the traditional dawadawa” (p. 64).

“The process of producing soybean dawadawa is similar with only one critical and major difference. The first major step of boiling the seeds of *P. biglobosa* for fourteen hours is changed to only one hour of boiling of the soybeans. The composition of *P. biglobosa* seed is 30% testa [seed coat] and 70% cotyledons (Campbell-Platt 1980) compared to soybean which is 10% testa and 90% cotyledons (Wolf



1971). The soybeans have a thin seed coat; the bran is easily removed after only one hour of boiling. An alternate method of removing the bran is to dry roast or fry the soybeans, imparting a golden brown color to the soybeans, then the beans are pounded to remove the bran (Odunfa 1986). The sequence of steps then follows the traditional method.” The author observed one woman and two men “produce both the traditional and soybean versions of dawadawa.

“The traditional dawadawa is greatly preferred for taste over the soybean version. Every person I interviewed for this study preferred the traditional. I believe this is due to the recent introduction of soybeans and slow adoption or acceptance of new foods. Konlani et al. (1999) states that *tonou* in Togo is now prepared from soybean. However, those interviewed would only use the soybean version because it was a cheaper substitute or because the traditional dawadawa was not available.

“One of the major advantages, perhaps a critical advantage in the future, is the shorter boiling period of the soybeans. The traditional dawadawa takes an enormous amount of fuel wood to boil the *P. biglobosa* seeds for fourteen hours when compared to the one or two hours necessary to boil the soybeans. Fuel wood is a precious commodity in all of West Africa and a major factor driving

deforestation in northern Ghana” (p. 65). “In Kandiga, the dawadawa is usually sold in the market by young children, mainly girls, and women” (p. 66).

The chapter on “Soybeans” states: “West African countries are looking to soybeans as ‘the miracle crop’ to alleviate malnutrition and poverty” (p. 80). “

“In 1987, the International Institute of Tropical Agriculture (IITA) supported with funds from the International Development Centre (IDRC) aggressively introduced soybeans into Nigeria. In 1985, Nigeria only produced 28 metric tons and in 1995, production increased to 200,000 metric tons (Dashiell 1998). In the last 20 years, several agencies within Ghana have advocated soybean cultivation. Ghana’s Ministry of Food and Agriculture (MoFA), Adventist Development and Relief Agency (ADRA), Catholic Relief Services (CRS), and other NGOs have been educating, promoting, and assisting farmers in the cultivation and use of soybeans” (p. 81).

“The presence of soybeans in Kandiga, both in the market and in the fields is on the increase. I worked directly with ADRA (Adventist Development and Relief Agency) farmers promoting agroforestry. Those chosen by ADRA were low-resource farmers who needed assistance attaining self-sufficiency. One of the expectations from ADRA for the farmers was to cultivate soybeans. Farmers were given soybean seed on credit and the assurance that ADRA would buy the harvest in lieu of cash for payments on farmer’s loans. I observed that non-ADRA farmers would also plant soybeans in their fields. One example was a widow, a neighbor of mine who farmed a small plot of soybeans from seed given to her from an ADRA farmer. The crop yields could vary with rainfall and proper spacing and cultivation methods. The greatest obstacle to the success of soybeans in Kandiga was that approximately half of the ADRA farmers would sell the seed for cash immediately, instead of planting it on their farms.” Photos show: (1) Forming balls of dawadawa. (2) Dawadawa balls left out to dry. (3) Royco bouillon cubes (top), traditional dawadawa (left), soybean dawadawa (right).

The author observed the increased substitution of soybeans for locust beans.

Note: This thesis was submitted toward a Master of Science in Forestry. The research was conducted from Sept. 1999 to Dec. 2001 during her service with the Peace Corps in Kandiga, Upper East Region, Ghana. Address: Michigan Technical Univ., Houghton, Michigan.

1740. Shimizu, A. 2002. [The structural change in the food system of “natto” (fermented soybeans) and correspondence of natto manufacturers]. *J. of Food System Research (Tokyo)* 8:13-24. [142 ref]\*

Address: Biotechnology Inst. of Natto, Suzuyo Kogyo Co. Ltd. Both: Tokyo, Japan.



1741. Hamauchi, Chinami; Sumi, Hiroyuki. 2002. Ketsueki sarasara nattô no soko jikara: kusuri yori kiku oishii nattô ryôri yonjûippin [Helping your blood to flow smoothly: Natto's deep potential power. 41 natto recipes that work better than any medicines]. Tokyo: Takara Jimasha. 96 p. 26 cm. [Jap]\*

1742. Machida, Shinobu. 2002. Nattô taizen: aisubeki dentô shokuhin no nazo o toku [The big and complete book of natto: Solve the mystery of the beloved traditional food—natto]. Tokyo: Kadokawa shoten. Illust. [Jap]\*  
Address: Japan.

1743. Nattô ga deatta aji hito furusato: nattôzuki niwa kotaerarenai jimoto no aji o ikashita nattô reshipi-shû [Natto met taste, people, and homeland: A natto recipe collection that makes good use of local taste, which natto lovers couldn't resist]. 2002. Tokyo: Gakken. 89 p. 26 cm. [Jap]\*  
Address: Japan.

1744. Sakamoto, Hiroko; Sakamoto, Kana. 2002. Nattô ryôri de genki hyakubai [Our energy and health becomes 100 times stronger with natto cookery]. Tokyo: Soshinsha. 101 p. 21 cm. [Jap]\*  
Address: Japan.

1745. Sass, Lorna J. 2002. Lorna Sass' complete vegetarian kitchen: Where good flavors and good health meet. New York, NY: William Morrow. An imprint of HarperCollins Publishers. xiv + 494 p. Index. 26 cm. [35\*+ ref]  
• **Summary:** First published in 1992 as *An Ecological Kitchen: Healthy Meals for You and the Planet* (William Morrow). This innovative vegan cookbook offers 250 cholesterol-free recipes. It features a complete glossary of wholesome ingredients for stocking the vegan pantry (no meat, dairy, or eggs). Address: New York City.

1746. Sugimoto, Keiko; Takamizawa, Etsuko. 2002. Ikiiki bijin no nattô reshipi: ketsueki sarasara ohada tsurusuru hone genki [Natto recipes for the beautiful woman: your blood flows smoothly, skin is glowing, and bones are healthy]. Tokyo: Sobokusha. [Jap]\*  
Address: Japan.

1747. Sumi, Hiroyuki. 2002. Shinkin kôsoku, nôkôsoku boke tonyôbyô o fusegu naosu: nattôkin iri fukugô aojiru no sugoi pawaa [Cure heart disease (myocardial infarction), stroke (cerebral infarction), senility, and diabetes: Extreme power of Green Juice which contains natto bacteria]. Tokyo: Bunsei Shuppan. 206 p. 19 cm. [Jap]  
Address: Japan.

1748. Tamang, J.P.; Thapa, S.; Dewan, S.; Jojima, Y.; Fudou, R.; Yamanaka, S. 2002. Phylogenetic analysis of

*Bacillus* strains isolated from fermented soybean foods of Asia: kinema, chungkokjang, and natto. *J. of Hill Research (Sikkim)* 15(2):56-62. [22 ref]

• **Summary:** A total of 38 strains of dominant endospore forming and rod shaped bacteria were isolated from kinema, chungkokjang, and natto (three closely related fermented soyfoods), and studied phenotypically. All endospore forming rods were identified as *Bacillus subtilis*. The average load of endospore forming bacteria of the samples was about 100 million colony forming units (CFU) per gm.

Fig. 1 (p. 60) is a "Phylogenetic tree [also called a horizontal cladogram] showing the relationships of *Bacillus subtilis* strains to other strains of the genus *Bacillus* and related genera based on partial sequence of 16S rRNA gene."

This suggests that *B. subtilis* strains responsible for the fermentation of sticky Asian soyfoods might have originated from the same stock. Address: 1-3. Food Microbiology Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1749. Thompson, David. 2002. Thai food (Aham Thai). Berkeley, California: Ten Speed Press. xiii + 673 p. Illust. Index. 25 cm. [218 ref]

• **Summary:** This is a superb, massive, beautiful and unique book—a wholistic study of food in Thai culture overflowing with lovely and expressive color photos by Earl Carter.

Contents: Acknowledgements. Introduction, by David Thompson, and author's notes. Part one: Thailand and food. 1. A history. 2. Culture and society. 3. Regions of Thailand. 4. Rice.

Part two: Fundamentals of Thai cooking. 5. The Thai kitchen. 6. Ingredients and basic preparations. 7. Relishes. 8. Soups. 9. Curries. 10. Salads. 11. Side dishes and accompaniments. 12. Menus.

Part three: Food 'outside' the meal. 13. Snacks. 14. Desserts. Select bibliography (Books in English: Primary sources 23. Secondary sources 65. Cookbooks 18. Total English: 106. Thai sources: Cookbooks 46. Memorial books: 66. Total Thai: 112. Grand total: 218).

Introduction: The author has written this book, in part, to describe this ancient cuisine which "reached an apex in the last decades of the 19th century," and "before it is eroded, altered and modernised." The transliteration is phonetic; it is not the official system devised by King Rama VI.

The section titled "The importance of Buddhism" (p. 38-40) in Thai cookery and culture states: "It is the obligation of every Thai male to become a monk for at least three months, usually around the age of 20,..." This is a rite of passage from childhood to adulthood; it acquaints each young man with the basics of Buddhism and meditation. Strict Buddhists abstain from eating meat and "there is a strong tradition of vegetarianism in Thailand." Meat does not have a primary role in the Thai diet and most Thai believe that forgoing meat earns merit for themselves or another. Some give up meat

once a week, or for a prolonged period, or even for an entire year.

Chapter 6, “Ingredients and basic preparations,” discusses the following: Bean curd (*dtor huu*): There are several types, from firm to soft. The author prefers the softest kind, sometimes called “silken bean curd.”

Fermented bean curd (*dtor huu yii*): Of Chinese origin and fermented with a red mold, it is sold in small jars and comes in two types: “very red, or creamy white veined with pink. The author prefers the latter, which is more versatile and subtle.

Fermented soy bean (*tua nao*): This ancient fermented product was once used extensively in Thai cookery. But it has largely been replaced by shrimp paste, so it is not so common now. “Before *tua nao* is used in a recipe, it is grilled or toasted, then ground.”

Soy sauce (*nahm siu uu*): A lighter-style soy sauce is generally preferred by Thai cooks. “Sweet Indonesian soy sauce (*kecap manis*) is used only occasionally.”

Yellow bean sauce (*dtow jiauw*): “This is a sauce based on yellow soy beans, which are salted and then fermented with rice mould... [it] tastes delicious, very much like Japanese miso.” Its use usually indicates a dish of Chinese influence. There are two basic types: “the first, and more traditional is creamy white; the more common one is honey brown.”

Peanuts and wing beans [winged beans] are also discussed in chapter 6.

Soy-related recipes: Murray perch and mushroom soup with yellow beans (*dtom het dtow jiauw*; p. 249). Light soy sauce (p. 341). Fermented bean curd simmered in coconut cream (*lon dtor huu yii*; p. 430-31). Deep-fried bean curd with crab, pork and spring onions. (*tor huu yord sai tort*; p. 440-42). Prawns and yellow beans simmered in coconut cream (*lon dtao jiauw*; p. 444-46). Pickled ginger with yellow beans (*king dong dtow jiauw*; p. 457). Bean curd stir-fried with bean sprouts (*tor huu pat tua nork*; p. 462). Bean curd and bean sprout soup (*tgeng jeut or huu orn*; p. 469-70). Stir-fried Siamese watercress with yellow beans, garlic and chillies (*pak bung fai dtaeng*; p. 532-33). Yellow bean and ginger sauce (*nam jim dtow jiauw*; p. 545). Spicy yellow bean sauce (*nam jim dtow jiauw*; p. 558). Address: Chef, restaurateur, cookery writer, and preserver of traditional Thai culture, Sydney, Australia.

1750. Treloar, Brigid; Inge, Karen. 2002. Healthy soy: Cooking with soybeans for health and vitality. Hong Kong: Periplus Editions (HK) Ltd. Printed in Singapore. 112 p. Illust. (color). Index. 24 x 22 cm.

• **Summary:** This is a beautiful book, with stylish and informative full-page glossy color photos on every other page. It is well researched, comprehensive, and generally uses standard soyfoods terminology. It is also strange: We are not told in which country the publisher is located

(perhaps Hong Kong or Singapore) or where the authors live. It is distributed in North America, Japan and Korea by Tuttle Publishing. On the inside rear dust jacket: [www.tuttlepublishing.com](http://www.tuttlepublishing.com). It is clearly targeted at a world market.

Contents: Introduction. The health benefits of soy: The heart, cancer, menopause, osteoporosis, weight control, allergies, lactose intolerance, the nutritional value of soy, protein, phytoestrogens, fats, calcium, soluble fiber, vitamins and minerals, energy, carbohydrates, how much soy do we need? (as an exchange for meat), how to use the nutrition table. Nutrition table (for various soyfoods). Soybeans: Green soybeans—fresh and frozen, dried soybeans, how to buy and prepare soybeans (selecting and storing dried soybeans, preparing dried soybeans, soaking, pan-roasting, boiling, pressure cooking, canned). Soy foods: Tofu (selecting and using, storing, freezing), bean curd sheets (yuba), deep-fried tofu (age; seasoned tofu), miso, tempeh, soya sauce (shoyu; regular, low-salt, light, tamari, ketjap manis), soy milk, soy flour, soy nuts, soy germ powder, soy oil, soybean sprouts, soybean paste (fermented), natto, soy dairy products (soy butter, soy spread {margarine}, soy cheese {plain or flavored}, cream cheese, yogurt, mayonnaise), soy meats (meat alternatives), others (soy breads, cereals, pasta, chocolate, chips, health bars, desserts, tofu ice creams), soy grits, tips (tofu, soy dairy products). Compatible soy flavors. Preparation and cooking techniques: Draining and pressing tofu, cutting tofu, deep-frying tofu, how to reconstitute yuba, how to use deep-fried tofu pouches, how to use miso, miso tips. Soups. Appetizers and dips. Light meals and snacks. Main dishes. Seafood. Vegetables. Salads. Desserts. Soy drinks. Glossary. Guide to weights and measures.

Note: This is not a vegetarian cookbook. Some recipes call for chicken, fish (swordfish, tuna, salmon), shrimp, etc. Address: 1. Food writer, stylist, consultant, and cooking instructor [Australia]; 2. Nutritionist and nutrition correspondent for *Good Morning Australia*.

1751. Watanabe, Sugio. 2002. Nattô: genryô daizu no erabikata kara hanbai senryaku made [Natto: From choosing the whole soybeans (as a raw material) to sales strategy]. Tokyo: Nô-san-gyoson Bunka Kyôkai. 120 p. Illust. 21 cm. [Jap]  
Address: Japan.

1752. Peng, Y.; Huang, Q.; Zhang, RH.; Zhang, YZ. 2003. Purification and characterization of a fibrinolytic enzyme produced by *Bacillus amyloliquefaciens* DC-4 screened from douchi, a traditional Chinese soybean food. *Comparative Biochemistry and Physiology. Part B, Biochemistry & Molecular Biology* 134(1):45-52. Jan. [Chi]\*

• **Summary:** Douchi is a traditional Chinese fermented and salted soybean food (also called “fermented black soybeans”) in the West. *Bacillus amyloliquefaciens* DC-4, which

produces a strongly fibrinolytic enzyme, was isolated from douchi. A fibrinolytic enzyme (subtilisin DFE) was purified from the supernatant of *B. amyloliquefaciens* DC-4 culture broth and displayed thermophilic, hydrophilic and strong fibrinolytic activity. The characteristics of subtilisin DFE are described. The first 24 amino acid residues of the N-terminal sequence of subtilisin DFE were identical to those of subtilisin K-54, and different from that of NK and CK. Results from subtilisin DFE gene sequence analysis showed that subtilisin DFE is a novel fibrinolytic enzyme. Address: College of Life Sciences, Sichuan University, Sichuan Key Laboratory of Molecular Biology and Biotechnology, Chengdu 610064, China.

1753. Suzuki, Y.; Kondo, K.; Ichise, H.; Tsukamoto, Y.; Urano, T.; Umemura, K. 2003. Dietary supplementation with fermented soybeans suppresses intimal thickening. *Nutrition (Burbank, California)* 19(3):261-64. March. \*

• **Summary:** Although soyfoods have been consumed in East Asia for more than 1,000 years, it is only during the past 20 years that they have made inroads into Western diets. We investigated the effect of dietary supplementation with natto extracts produced from fermented soybeans on intimal thickening of arteries after vessel endothelial denudation. Natto extracts include nattokinase, a potent fibrinolytic enzyme having four times greater fibrinolytic activity than plasmin. Address: Dep. of Pharmacology, Hamamatsu Univ. School of Medicine, Shizuoka, Japan.

1754. **Product Name:** [Nattoesse: Essence of Natto Food].  
**Foreign Name:** Nattoesse.  
**Manufacturer's Name:** Ventrep Sante, Inc. (Importer/Marketer). Made in Japan by Gudo Shusei Co., Ltd. (Tokyo).  
**Manufacturer's Address:** 3-3-26-201 Jingu-mae, Shibuya-ku, Tokyo 150-0001, Japan. Phone: +81 3 3401 8360.  
**Date of Introduction:** 2003. March.  
**Ingredients:** Natto.  
**How Stored:** Shelf stable.  
**New Product–Documentation:** Leaflet (8½ by 11 inch, color) from Natural Products Expo West (Anaheim, California). 2003. March. “Nattoesse: Essence of Natto Food. Soy beans naturally fermented by *Bacillus* (NattoVR 501) living in rice straws.” Contents: A functional food from traditional Japanese diet. Research reports. A brief story [history] of natto food and nattokinase.

1755. Kasahara, Takaoki; Kato, Tadafumi. 2003. A new redox-cofactor vitamin for mammals. *Nature (London)* 422(6934):832. April 24. [10 ref]

• **Summary:** A Japanese research team confirmed that PQQ (pyrroloquinoline quinone), a substance discovered in 1979, can be classified as a vitamin. More specifically, it is a new B vitamin, joining niacin / nicotinic acid (vitamin B3) and riboflavin (vitamin B2)—first new vitamin in 55 years. The

most concentrated known source of PQQ is natto, a type of soybeans fermented by *Bacillus natto* bacteria. The new vitamin plays an important role in the fertility of mice and may have a similar function in humans.

Note 1. This is the earliest document seen (Jan. 2012) that mentions PQQ in connection with natto.

Note 2. A Google search of natto + pqq (July 2009) gets 2,480 hits. Natto is an excellent source of PQQ, a critical nutrient for skin health. PQQ is essential to the mammalian diet, meaning it can only be obtained from food sources. Address: Lab. for Molecular Dynamics of Mental Disorders, Brain Science Inst., RIKEN, Wako-shi, Saitama 351-0198, Japan.

1756. *Ontario Soybean Growers Newsletter*:2003. The Australian soybean industry. May. p. 5.

• **Summary:** “This article was written by Dr. Malcolm Morrison, an Oilseed Physiologist with Ag Canada. He is currently on a study leave in Australia.

“In 2002, Australia produced 70,000 tonnes (metric tons) of soybean on 30,000 ha (74,000 acres) of land. Major production areas are in southern Queensland and northern New South Wales, with pockets in other irrigated regions of the country. Soybeans are planted during summer and most production is irrigated. Soybeans are used as a green manure crop in sugar cane, returning 40 to 300 kg/ha (35- 267 pounds / acre) of nitrogen, depending on whether the seeds are harvested or the crop ploughed in green.

“Annual Australian demand for soybeans far outstrips national production. The crushing industry imports about 40,000 tonnes of seed and the livestock industry imports up to 360,000 tonnes of solvent extracted meal, mostly from the United States. The baking industry uses another 14,000 tonnes of Australian grown, full-fat soy flour.

“With the drought of 2002-2003, production has dropped by 50%. Farmers have only planted the crops that they could afford to irrigate. This year it was almost as profitable to sell stored water as it was to plant and harvest a field of soybeans. In the irrigated cash crop regions, soybeans are last on the list of preferred crops after cotton, corn, grain sorghum, and sunflowers.

“Phytophthora, white mold, mildew, and soybean rust are major diseases, while insect pests are silverleaf whitefly, green veggie bug, aphids, scale bugs and mites. Plant breeders are developing disease resistant varieties and pest specialists are releasing parasitic insects, and creating viral and fungal biopesticides. Plant breeders are selecting white hilum varieties with good yield, agronomics and natto and tofu characteristics. Many of the new varieties have Canadian parents and are being tested in Asia with favourable results.

“The Australian soybean industry is beginning to target the same high value soyfood markets in Asia that Canada has been focusing on for years. Australia has a ‘clean/green’



reputation since they do not produce GMO food crops. They intend to capitalize on this image to capture food grade soybean niche markets in the near future. Producing an assured supply of high quality, non-GMO soybeans will be a challenge in the Australian environment.” Address: Chatham, ONT, Canada N7M 5L8.

1757. Yamamoto, Seiichiro; Sobue, T.; Kobayashi, M.; Sasaki, S.; Tsugane, S. 2003. Soy, isoflavones, and breast cancer risk in Japan. *J. of the National Cancer Institute* 95(12):906-13. June 18. [44 ref]

• **Summary:** Breast cancer risk was reduced by one half in Japanese women who ate three or more bowls of miso soup on an almost daily basis. The report monitored 21,852 from 1990 to 2000. Post-menopausal women showed the greatest reduction of risk.

“In Japan, soy is consumed in various forms, including dried or green soybeans, tofu (soybean curd), natto (fermented soybeans), miso (fermented soybean paste), okara (tofu lees), soybean sprouts, soymilk, yuba (soy milk skin), kinako (soy flour), and soy sauce.” Address: Cancer Information and Epidemiology Division, National Cancer Center Research Institute, Tokyo, Japan.

1758. Suganama, Kiyoshi; Sumi, Hiroyuki. 2003. Kono fukugô aojiru de shinkin kôsoku nôkôsoku boke tōnyō-byō kara dasshutsu shita: nattō-kin nattōkinaze to ryokuyō yasai juishshurui fukugô [I escaped from heart attack, stroke, senile psychosis, and diabetes using this compounded green juice: Natto bacteria, nattokinase, and 11 green leafy vegetables combined]. Tokyo: Gendaishorin. 197 p. 19 cm. [Jap]\*

1759. Tamang, Jyoti Prakash. 2003. Native microorganisms in the fermentation of *kinema*. *Indian J. of Microbiology* 43(2):127-30. June. [19 ref]

• **Summary:** Species of *Bacillus*, *Enterococcus*, *Geotrichium*, and *Candida* were recovered. Address: Food Microbiology Research Lab., Dep. of Botany, Sikkim Government College, Gangtok, Sikkim 737 102, India.

1760. Tanaka, Tadayoshi; Yamauchi, Tomoko; Katsumata, Rie; Kiuchi, Kan. 2003. [Comparison of volatile components in commercial itohiki-natto by solid-phase microextraction and gas chromatography]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 50(6):278-85. [23 ref. Jap; eng]

• **Summary:** “The volatile component in commercial itohiki-natto was extracted with divinylbenzene / carboxen / polydimethylsiloxane solid-phase microextraction fiber at 50°C for 60 minutes, and injected by gas chromatograph (GC) or gas chromatograph mass spectrometer (column: DB-WAX (0.25mm ID, 30m long, 0.25µm film thickness)). Each peak was identified by comparing the mass spectrum and the retention indices with the mass spectrum databases and

the retention indices of authentic compounds, respectively. Twelve alcohols, 20 ketones, 12 fatty acids, 12 nitrogen compounds, 10 hydrocarbons, 8 esters, 3 phenols, 2 frans, 1 aldehyde, 1 pyrane, 1 oxazole, and ammonia = a total of 83 compounds were identified” (from journal@rchive). Address: 1. Dep. of the Science of Living; 2. Faculty of Home Economics. All: Kyoritsu Women’s Univ., 2-2-1, Hitotsubashi, Chiyoda-ku, Tokyo 101-8433, Japan.

1761. Suzuki, Y.; Kondo, K.; Matsumoto, Y.; Zhao, B.Q.; Otsuguro, K.; Maeda, T.; Tsukamoto, Y.; Urano, T.; Umemura, K. 2003. Dietary supplementation of fermented soybean, natto, suppresses intimal thickening and modulates the lysis of mural thrombi after endothelial injury in rat femoral artery. *Life Sciences (Netherlands)* 73(10):1289-98. July 25. \*

Address: Dep. of Pharmacology, Hamamatsu Univ. School of Medicine, 1-20-1 Handayama, Hamamatsu City, Shizuoka 431-3192, Japan.

1762. *ASA Today (St. Louis, Missouri)*. 2003. Grower opportunities for identity preserved value-added soybeans. 9(10):8-page insert after p. 4. Sept.

• **Summary:** Contents: Front: Introduction. What are specialty soybeans? The rewards of IP production. Cooperative efforts pay dividends. The importance of contract flexibility. Defining identity preservation vs. segregation vs. channeling.

Back: Value-added soybean varieties: Certified seed, clear hilum tofu, high sucrose, low saturated fat / low linolenic, “non-GMO” soybeans, organic food grade, natto, high oleic, high protein. IP soybeans: Production contracts: Introduction, delivery and payment, delivery specifications, developing relationships, other legal considerations, a final word. Sponsored by BASF, makers of Prowl, Pursuit, and Raptor herbicides.

1763. Inagaki, Shyuichiro; Domon, Eiji; Saito, Akira; Akutagawa, Hiroshi. 2003. [Discrimination of *Bacillus subtilis* natto “strain KA-145” using insertion sequence, *IS4BsuI*]. *Nippon Shokuhin Kagaku Kogaku Kaishi (J. of the Japanese Society for Food Science and Technology)* 50(10):483-87. [18 ref. Jap; eng]

• **Summary:** “We established a simple method for identifying *Bacillus subtilis* natto strain KA-145 by PCR [polymerase chain reaction]. *B. subtilis* natto is indispensable as a starter strain for fermenting the traditional Japanese food natto. *B. subtilis* natto strain KA-145 is a recent isolate with high nattokinase activity compared to the normal strain. Discrimination of the bacterial strains is important in controlling contamination of the strains” (from journal@rchive).

Note: An insertion sequence (also known as an IS, an insertion sequence element, or an IS element) is a short DNA

sequence that acts as a simple transposable element. Insertion sequences have two major characteristics: they are small relative to other transposable elements (generally around 700 to 2500 bp in length) and only code for proteins implicated in the transposition activity (they are thus different from other transposons, which also carry accessory genes such as antibiotic resistance genes). (Source: Wikipedia, Feb. 2012). Address: 1-3. National Agricultural Research Center for Kyushu Okinawa Region, Suya 2421, Nishigoushi, Kikuchi, Kumamoto-ken 861-1192, Japan.

1764. Hauzel, Hoihnu. 2003. The essential North-East [India] cookbook. New Delhi, India; New York, NY: Penguin Books. x + 183 p. Illust. 21 cm. \*

• **Summary:** “Cooking recipes from Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura; India.” Akhuni [Aakhone], a fermented soybean food, is mentioned.

Note: *Akhuni* [also called *Aakhone*] is a fermented soyfood made and used by the Sema Naga in the north east Indian state of Nagaland.

Note 2. This is the earliest document seen (Jan. 2012) that uses the word “Akhuni” to refer to a fermented soyfood from Nagaland and a close relative of Japanese natto.

1765. Farnworth, Edward R. 2003. Handbook of fermented functional foods. Boca Raton, Florida: CRC Press. 390 p. See p. 227, 295. Index.

• **Summary:** An overview, with two chapters on fermented soyfoods (natto and miso) cited separately. Chapter 1, titled “History of fermented foods” (p. 1-25) includes brief and vague histories of “Soy foods” including (p. 18-19) soy sauce, miso, tempeh, natto, and sufu [fermented tofu].

Chapter 4, titled “Kefir: A fermented milk product” (p. 77+) states (p. 85-86) that kefir can be made by growing kefir grains in soybean milk (Abraham and de Antini 1999, p. 327-33).

Chapter 9 is “Natto—A food made by fermented cooked soybeans with *Bacillus subtilis* (natto),” (p. 227-245).

Chapter 11 is “Miso: Production, properties, and benefits to health” (p. 277-87). Chapter 12 is “Korean fermented foods: Kimchi and doenjang” (p. 287-305). Soyfoods mentioned on page 289 include ganjang (soy sauce), doenjang (fermented soybean paste), chongkukjang (quick fermented soybean paste), and gochujang (hot chili pepper soybean paste); each of these is a major condiment in Korean cuisine. Address: PhD, Senior Research Scientist, Food Research and Development Centre, Agriculture and Agri-Food Canada, St. Hyacinthe, Quebec, Canada.

1766. Fujita, Masako. 2003. Itsumo no gohan ni nattô sae areba [If I only had natto with my ordinary meals]. Tokyo: Takahashi Shoten. 111 p. 26 cm. [Jap]\*

1767. Hamauchi, Chinami. 2003. Mainichi nattô: karada ni yasahii kara [Everyday natto: because it is good for your body]. Tokyo: Jitsugyo Nonihonsha. 125 p. 21 cm. [Jap]\*

1768. Hoshikawa, Hiroko; Hoshikawa, Haruo; Koizumi, Takeo. 2003. Shôta to nattô [Shôta and natto]. Tokyo: Popurasha. Unpaginated. Illust. (color). 21 x 27 cm. [Jap]\*  
• **Summary:** For a juvenile audience. Shôta is a Japanese boy. His grandfather teaches him that natto is a magical food. Starting from growing soybeans to making natto, the whole process of making fermented soyfoods is introduced.

1769. Hosoi, Tomohiro; Kiuchi, Kan. 2003. Natto—A food made by fermenting cooked soybeans with *Bacillus subtilis* (natto). In: Edward R. Farnworth. 2003. Handbook of Fermented Functional Foods. Boca Raton, Florida: CRC Press. 390 p. See p. 227-50. [111 ref]

• **Summary:** Contents: Fermented soybean foods in Asia. Ingredients of natto: *Bacillus subtilis* (natto) spores, soybeans (color, size, protein content, sugar content, washing and storage methods). Natto processing: Washing and soaking of soybeans, steaming of soybeans, inoculation with *Bacillus subtilis* (natto) spores, packaging, fermentation, packing for shipment, changes in packages. Assessment of quality: Chemical composition, sensory tests (8 criteria), changes in consumers’ preferences (growing preference for larger soybeans and natto with markedly weaker odors and strings). Health benefits: *Bacillus subtilis* (natto) cells (effects on intestinal microflora and feed efficiency, effects on the immune system, anti-allergy effect of subtilisin, fibrinolytic activity of subtilisin, role of vitamin K-2 (menaquinone-7) in the prevention of osteoporosis), phytoestrogens—effects on cancer and osteoporosis. Conclusions.

Natto and related foods are all made by fermentation with the bacterium *Bacillus subtilis* (natto). These include sweet dou chi (*xian doushi*) in China (where it is used as a seasoning for Beijing duck [Peking duck]), kinema in Nepal and Myanmar, *tua nao* in Thailand, and *chungkuk-jang* in Korea.

In the year 2000 a total of 10.1 million metric tons of soybeans in Japan were converted directly into foods; more than 80% of these soybeans were imported. Between 1991 and 2000 there was a 13% increase in soybean consumption for natto products.

Natto makers prefer to use certain soybean varieties such as Suzuhime and Suzumaru which are grown in Hokkaido, Kosuzu in Iwate, Miyagi, and Akita Prefectures, and Natto-Shoryo in Ibaraki Prefecture.

Natto makers generally desire the following qualities in soybeans: 1. Extra small or small size (for consumers from Tokyo northward). 2. Easily washable. 3. Yellow surfaces

and hila. 4. A suitable degree of stickiness when made into natto. 5. Relatively sweet taste. 5. Minimal changes in constituents and appearance during storage.

In Japan, soybeans are classified by diameter into four groups: (1) Extra small is less than 5.5 mm diameter. (2) Small is 5.5 mm to 7.3 mm. (3) Medium is 7.3 mm to 7.9 mm. (4) Large is greater than 7.9 mm in diameter.

Japan's leading natto trade association is called the "Federation of Japan Natto Manufacturers Cooperative Society."

A soybean allergen has been identified as *Gly m d 28K*. This allergen is found in high concentrations in various nonfermented soybean products such as soy protein isolate, tofu, dried frozen tofu, and yuba. However fermented soybean products such as natto, soy sauce and miso do not contain this allergen. "*Bacillus subtilis* (*natto*) produces a serine protease [proteolytic enzyme] of subtilisin NAT during its growth. Subtilisin NAT appears to degrade *Gly m d 28K*."

"Circulating platelets and blood-derived proteins (fibrin) are essential for the formation of blood clots, which prevent bleeding long enough for healing to occur. However, excess coagulation prevents normal physiologic blood flow, which causes thrombotic disorders. Thrombolytic therapy is the most direct means of restoring blood flow. *Bacillus* spp. produce serine proteases called subtilisins, which are known to have fibrinolytic activity" [8 references cited]. Address: 1. PhD, Tokyo Metropolitan Food Research Centre; 2. PhD, Dep. of Food Science and Nutrition, Kyoritsu Women's University. Both: Tokyo, Japan.

1770. Kakure nôkôsoku ni nattô kinaze ga kiku: dekite shimatta kessen to kasu yuiitsu no kôso [Nattokinase helps for an undetected stroke: the only enzyme that dissolves an already developed blood clot / thrombus]. 2003. Tokyo: Shufunotomo Infosujohosha. 96 p. 26 cm. [Jap]\*

1771. Kwon, Hoonjeong; Kim, Young-Kyung Lee. 2003. Korean fermented foods: Kimchi and doenjang. In: Edward R. Farnworth. 2003. Handbook of Fermented Functional Foods. Boca Raton, Florida: CRC Press. 390 p. See p. 287-304. Chap. 12. [86 ref]

• **Summary:** Contents: Introduction. Kimchi: Changes during fermentation, cancer, cardiovascular disease, nitrosamines and ethyl carbonate.

Doenjang: Cancer (epidemiology, anticarcinogenic and antimutagenic activities in vitro and animal models), cardiovascular disease (inhibition of angiotensin converting enzyme, antithrombotic peptides), isoflavones. Conclusions. Acknowledgments.

Note: Angiotensin is an oligopeptide in the blood that causes vasoconstriction (constriction of blood vessels), increased blood pressure, and release of aldosterone from the adrenal cortex. It is a hormone. The inhibition of angiotensin converting enzyme is thought to help relieve medical

conditions such as high blood pressure, heart failure, diabetic nephropathy and type 2 diabetes mellitus.

Table 12.1 titled "Fermented food consumption by the Korean population" (gm per person per day) gives statistics for the following soy based foods:

Ganjang (soy sauce): Overall 6.6, highest 8.0 in persons aged 30-49.

Gochujang (hot pepper-soybean paste): Overall 3.7, highest 5.2 in persons aged 30-49 years.

Doenjang (soybean paste): Overall 5.6, highest 8.0 in persons aged 50-64.

Jajang (black [soy] bean paste): Overall 1.1, highest 1.8 in persons aged 7-12.

Chongkukjang (soybean paste, quick fermented [Korean-style natto]): Overall 1.0, highest 2.4 in persons aged 65 or older.

Mixed bean paste: Overall 1.0, highest 1.5 in persons aged 30-49.

Total: 19.0, highest 24.4 in persons aged 30-49.

Source: Adapted from Ministry of Health and Welfare, Report on 1998 National Health and Nutrition Survey (Dietary Intake Survey), Korea Health Industry Development Industry.

Conclusion: There is presently no conclusive evidence showing human health benefits from consumption of Korean fermented soyfoods. Address: 1. PhD, Food Toxicology Div., Dep. of Food and Nutrition; 2. Research Inst. of Home Ecology. Both: Seoul National Univ., Seoul, Korea.

1772. Miso, tôfu, nattô [Miso, tofu and natto]. 2003. Tokyo: Nosan Gyoson Bunka Kyokai (Agricultural and Fishing Village Cultural Organization). 249 p. 22 cm. Series: Kikigaki Furusato no Katei Ryori (Written as Heard Home Cooking of the Homeland), no. 16. [Jap]\* Address: Japan.

1773. Saito, Shigeta. 2003. Nattô shugi no ikikata [The way of living based on natto principles]. Tokyo: Soshinsha. 155 p. 19 cm. [Jap]\*

1774. Sumi, Hiroyuki. 2003. Kono aojiru o nomeba shinkin kôsoku, nôkôsoku, boke, tônynô-byô wa kowakunai; nattô-kin nattôinaze to ryôkuyô yasai juisshurui fukugô [If you drink this green soup, you need not be afraid of heart attack, stroke, senile psychosis, or diabetes: Natto bacteria, nattokinase, and 11 green leafy vegetables combined]. Tokyo: Gendai Shorin. 198 p. 19 cm. [Jap]\*

1775. Uchi no nattô ga ichiban oishii: ryôri ni karada ni ii. Shiranakatta nattô reshipi no kotsu no kotsu [My natto recipes are the most delicious: Natto is good for both cooking and for your health. Tricks and secrets for natto recipes you've never heard of]. 2003. Tokyo: Gakushu Kenkyusha (Gakken). 81 p. 26 cm. [Jap]\*

1776. Watanabe, Junko. 2003. *Nattô ryôku: taberu kusuri* [Natto power: Edible medicine]. Tokyo: Kodansha. 63 p. 26 cm. [Jap]\*

1777. Ko, J.H.; Yan, J.P.; Zhu, L.; Qi, Y.P. 2004. Identification of two novel fibrinolytic enzymes from *Bacillus subtilis* QK02. *Comparative Biochemistry and Physiology Part C: Toxicology & Pharmacology* 63(12):1121-23. June 15. \*

• **Summary:** “Two fibrinolytic enzymes (QK-1 and QK-2) purified from the supernatant of *Bacillus subtilis* QK02 culture broth.” These enzymes were designated subtilisin QK. Address: 1. Institute of Molecular Virology, College of Life Science, Wuhan University, Wuhan, Hubei, PR China 430072.

1778. Zenkoku Natto Kyodo Kumiai Rengokai (Japanese National Natto Assoc.). ed. 2004. *Nattô kindai gojû nenshi* [Natto’s recent history: 50 years]. Tokyo: Zenkoku Natto Kyodo Kumiai Rengokai. 439 + 31 p. Plus 8 unnumbered pages of plates at front. Illust. No index. 20 cm. [1 ref. Jap] • **Summary:** Name of organization with diacritics is: Zenkoku Nattô Kyôdô Kumiai Rengokai. Contents: Graph of natto production (in 1,000 metric tons {tonnes}) in Japan from 1970 to 2002 (see next page). Production increased from 115,000 in 1970 to 187,000 in 1989 to 230,000 in 1998 to 254,000 in 2002. 31 unnumbered pages of glossy photos, mostly of people connected with the Natto Association. 1. History of natto (before World War II). 2. History of natto (after World War II). 3. From soybeans to natto: History of natto containers. 4. History and usage of mustard for natto: History of sauce (*taré*). 5. Comments from the researchers: Suggestions / proposals.

6. Big and complete book about the nutritional value of natto—How wonderful natto is! [*Nattô Taizen*, by Shinobu Machida, published in 1997]. 7. Longevity with native / local natto foods and cookery: The Japanese chain of islands, natto cuisine is traveling. 8. Study of spices / condiments (*yakumi*). 9. Natto cooking a la carte. 10. Activities, directions, and work details of the Japanese National Natto Association. 11. Timeline / chronology of Japanese National Natto Assoc. 12. Meetings / gatherings for judging samples of natto. 13. How this book was published: Regarding the use of questionnaires. Address: Tokyo, Japan.

1779. Brown, Allan; Brown, Susan. 2004. Tempeh tofu and other new developments (Interview). *SoyaScan Notes*. March 20. Conducted by William Shurtleff of Soyfoods Center. • **Summary:** They recently had a visitor who makes “tempeh tofu” commercially in Australia. Tempeh is probably pasteurized then crumbled and added to the tofu curds before they are pressed into tofu. When you slice the tofu, there is a marbled effect with tempeh in the middle. The visitor is

sending Allan the labels. “What a great, original idea! It is widely distributed and Australians love it because it has more flavor than tofu and it is not as heavy as tempeh.”

In Vancouver, BC, a company named Gaia Enterprises Inc. makes natto and sells the spores. Noble Bean has been thinking about making natto, but Shurtleff warns against letting natto spores (a strong contaminant) get near tempeh.

Two years ago, Soy City Foods joined with another company, Second Nature, to become Sol Cuisine. They still make lots of good tofu but they have stopped making tempeh; they made only okara tempeh (to add value to the okara left over from making tofu) and only for the institutional market (mostly university cafeterias). The nutritional profile and consistency were both poor. Sol Cuisine is using certified organic soy isolates to make meat alternatives (incl. ground round, hot dogs, etc.), thereby challenging Yves, which uses regular isolates—perhaps made using hexane. The sales manager at Sol Cuisine is a close friend of Allan and Susan’s from The Farm. Sol Cuisine wanted Noble Bean to private label tempeh for them. Allan now wants to talk with them about making “tempeh tofu.”

The Farm in Summertown, Tennessee, is now a good, reliable source of tempeh spores. Noble Bean gets all its tempeh spores from the Farm.

Sooke Soyfoods has become Green Cuisine in British Columbia; established in 1989, they have a vegan restaurant and also make a line of soyfood products. Address: Founders, Noble Bean, R.R. #1, McDonalds Corners, ON K0G 1M0 Canada. Phone: 613-278-2305.

1780. **Product Name:** Soy Natto–Natto Boy Snack Nuts [Plain, or Sea Salt & White Soy Sauce].

**Manufacturer’s Name:** Soy Natto Food Co. (Importer-Distributor). Made in Japan.

**Manufacturer’s Address:** 1015 East Howard Ct., Visalia, CA 93292. Phone: 559-679-9699.

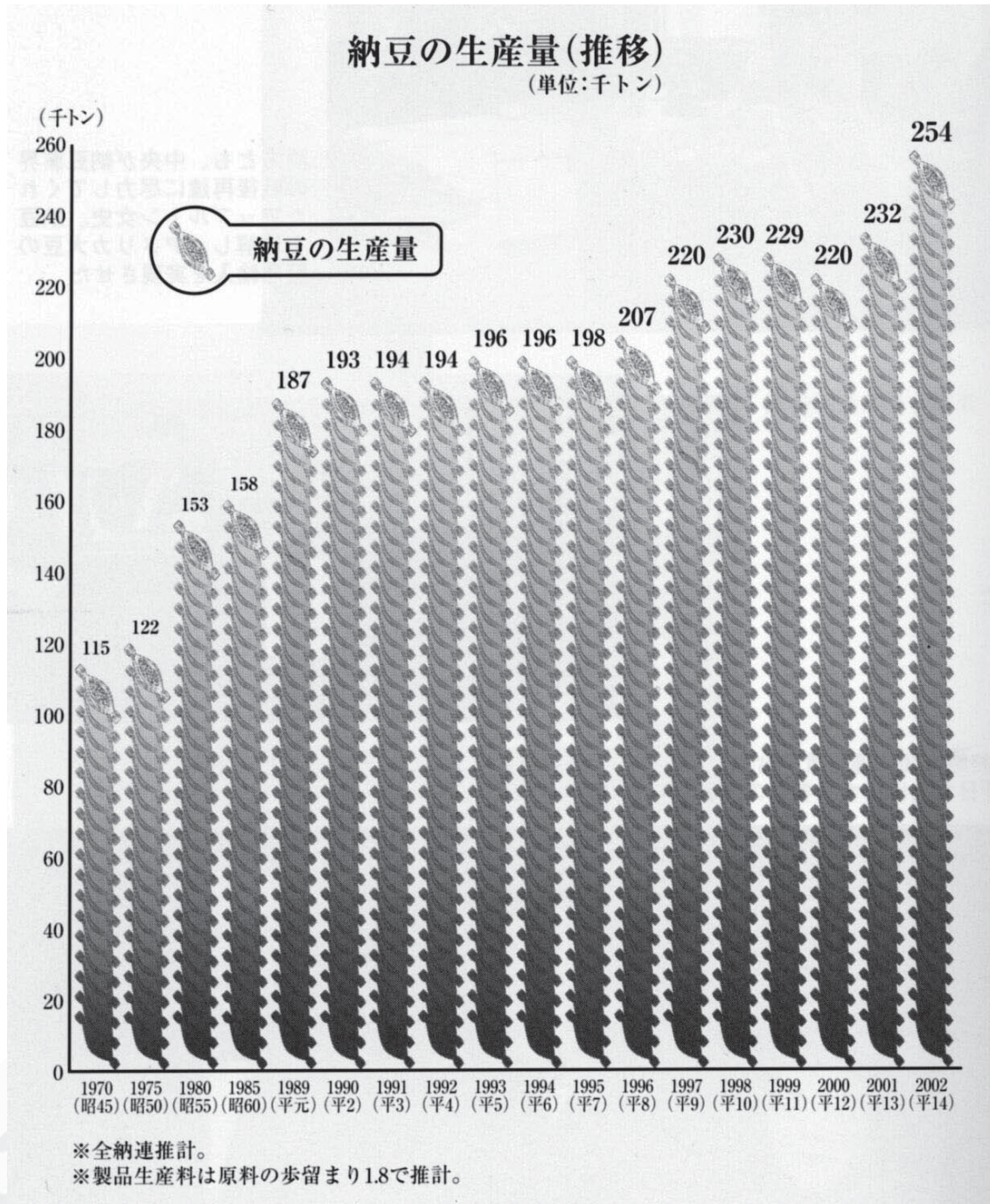
**Date of Introduction:** 2004. March.

**Ingredients:** Sea Salt: Soybeans, Subtilis natto, White soy sauce, sea salt.

**Wt/Vol., Packaging, Price:** 1.06 oz (30 gm) plastic pouch.

**How Stored:** Shelf stable.

**New Product–Documentation:** Sell sheet (8½ by 11 inch, color) sent by Patricia Smith from Natural Products Expo West (Anaheim, California). 2004. March. “New generation soy food: Soy natto.” “Healthy and happy snack from kids to seniors. Easy to crunch, enjoyable for snacking.” Also press release dated March 5, 2004. “Soy Natto Food Company is proud to unveil its new products, ‘Soy Natto Snack Nuts’... into North America and Europe Markets at Natural Products Expo West at Anaheim, California on March 5, 2004. Soy Natto is a dried food product derived from fermented soy beans. Fermented soy beans, known as ‘Natto,’ have received positive attention for the natural enzyme, Nattokinase, and ability to help maintain a healthy circulatory system in



# New Generation Soy Food *Soy Natto*

## - Fermented Soy Beans, Dried Products -

*Soy Natto* is a dried product derived from fermented soy beans. The fermentation of soy beans enhances flavor and nutritional value. It also adds functionalities to soy while reducing the few negative properties known to exist in this wonderfully healthy food. Fermented soy beans, Natto have recently received positive attention for the natural enzyme, Nattokinase and ability to help maintain a healthy circulatory system.

**Our product development** has tried to make its taste more appealing for those who are not accustomed to it in their diet. **Our manufacturing technology** provides a crunchy texture that is often enjoyed with dried foods while attempting to assure the finished product's high degree of nutritional values and physiological functionalities. These properties are often lost in the conventional manufacturing or high heat drying or oil-frying process. **Our marketing** tries to assure availability of the products and disseminate information to those who expect healthy eating.

### Product

#### Soy Natto Snack Nuts

Healthy & Happy Snack for Kids to Seniors  
Easy to Crunch, Enjoyable Snacking

#### Soy Natto Salad Toppers

Healthier salad topping than bacon bits or analogues  
Applicable before serving over pizza, pasta, baked potato,  
anything for additional seasoning and health benefit.



## Natto Fermentation and Health

Fermentation is a process involving the energy generation, body building and reproduction of microorganisms. At the top of the food chain, human utilizes fermentation primarily for preservation of food. We use the process specifically targeting beneficial microorganisms to convert raw food stuffs to fermented products and prevent further spoilage due to microbes. Fermentation also brings about many good effects, such as an increase in palatability, nutrition and physiological functions, and a decrease in unfavorable components and functions. Cheese, Kefir, yogurt and other dairy products, pickles, some sausages, wine, and beer are among the other examples of fermented foods which have been staples in our diet for many centuries.

Natto has distinct fermented smell and sticky texture. The characteristic smell is similar to that of bacterial surface aging cheese like Limburger from Belgium, Liederkranz, Brick or Monterey from the US, St. Paulin or Brie from France, Muenster from Germany and Bel Paese from Italy. The sticky texture is similar to chopped Okura or melted Mozzarella cheese. This particular soy beans fermentation actually adds nutrition and physiological functions to soy beans and also removes or reduces some of the negative properties of soy beans. Via this process, fermented soy beans, Natto will have a pleasant palatability, improved nutrition, better digestion, and more health effect than regular soy beans.

## Soy Beans and Soy Natto

	Soy Beans	Soy Natto
Protein	Amino acid composition often with deficiency of S-amino acids	Composition improved by fermentation
Carbohydrates	Gas formation from Melibiose	Less gas formation
Growth Inhibitor (1)	Trypsin inhibitor Haemagglutinin	Fermentation reduces its activity or deactivates the function.
Thyroid function (2)	Goitrogens	Reduced its activity
Kinase (3)	None	Natto kinase*
Phytate(4)	High content	Reduced by fermentation
Genistein	Genistin form, not bio-available	30 mg, 5 times more
Digestibility	Often poorly digested	Improved digestion
Probiotic function	None	Suppress pathogenic coliforms
Palatability	Beany odor	Fermented smell
Nutrition		Addition of vitamins (B <sub>2</sub> , K)
Texture	Often hard to crunch	Easy to crunch

## For further info. and contact

[www.soynatto.com](http://www.soynatto.com)

**Soy Natto Food Company**

1015 E. Howard Ct., Visalia, CA 93292

FAX 559-739-1972 [info@soynatto.com](mailto:info@soynatto.com)





addition to diversified beneficial functions.” Natto has a long history in Japan, going back many centuries. Contact: [www.soyнатto.com](http://www.soyнатto.com) or [info@soynatto.com](mailto:info@soynatto.com).

Product with Label sent by Mike Masuyama, PhD, of Visalia. 2006. June. 4 by 6 inches plastic pouch. Two flavors. On the front panel is a color cartoon of Natto Boy, a soybean, with a smiling mouth, eyes, 2 hands, and 2 feet. On the sea salt flavor he is wearing a flat-brimmed yellow hat with a red flower in it. Nutrition facts and barcode are also on the front panel; there is no printing on the back of the package. The natto inside have been dried until crunchy, quite like soynuts. Soyfoods Center taste test. The salted ones have a good flavor and texture. The unsalted are quite bland.

Note: K. Mike Masuyama, PhD (Executive Vice President) and Christopher K. Maruyama (Marketing Manager) both sell “Spirit of the Sea” High Mineral Sea Salt. A leaflet (8½ by 11 inches, 3 panels each side) gives details.

1781. **Product Name:** Soy Natto–Salad Toppers (Fermented Soy & Veggie Salad Topping). Renamed Natto Boy: Natto & Veggie Toppers by June 2006.

**Manufacturer’s Name:** Soy Natto Food Co. (Importer-Distributor). Made in Japan.

**Manufacturer’s Address:** 1015 East Howard Ct., Visalia, CA 93292. Phone: 559-679-9699.

**Date of Introduction:** 2004. March.

**Ingredients:** Fermented soy (soybeans, *Subtilis natto*), sesame, carrots, cabbage, rice, wakame sea vegetable.

**Wt/Vol., Packaging, Price:** 1.06 oz (30 gm) plastic pouch with self-seal top (like Ziploc).

**How Stored:** Shelf stable.

**New Product–Documentation:** Sell sheet (8½ by 11 inch, color) sent by Patricia Smith from Natural Products Expo West (Anaheim, California). 2004. March. “New generation soy food: Soy natto.” “Healthier salad topping than bacon bits or analogues. Applicable before serving over pizza, pasta, baked potato, anything for additional seasoning and health benefit” Also press release dated March 5, 2004. “Soy Natto Food Company is proud to unveil its new products, ‘Soy Natto Salad Toppers’... into North America and Europe Markets at Natural Products Expo West at Anaheim, California on March 5, 2004...” Contact: [www.soyнатto.com](http://www.soyнатto.com) or [info@soynatto.com](mailto:info@soynatto.com).

Product with Label sent by Mike Masuyama, PhD, of Visalia. 2006. June. 4½ by 7½ inches plastic pouch. On the front panel is a color cartoon of Natto Boy, a soybean, with a smiling mouth, eyes, 2 hands, and 2 feet. The tagline now reads: “Natto Boy Natto & Veggie Toppers.” Nutrition facts and barcode are also on the front panel; there is no printing on the back of the package. The natto pieces inside have been dried until crunchy, quite like pieces of soynuts. Soyfoods Center taste test: Fair flavor (quite bland) and texture. The only salt comes from the wakame.



1782. Nagayama, Hisao. 2004. *Nattô banzai* [Cheers to natto]. Tokyo: Hifumi Shobo. 229 + 4 p. 19 cm. [Jap]\*

• **Summary:** Mr. Hisao Nagayama was born in 1932.

1783. Williams, David. 2004. The clot-busting miracle that unclogs arteries, reverses heart disease. *Alternatives–For the Health Conscious Individual (Rockville, Maryland)* 9(28):1, 3-5. [2 ref]

• **Summary:** In Japan, heart disease is practically unknown. In 1980 a young doctor named Hiroyuki Sumi set out to discover why. New research indicated that a major culprit in causing heart disease and strokes might be blood clots that lodge in the arteries and cut off the oxygen supply to the heart and brain. After carefully testing 173 common Japanese foods, he found that the most powerful clot-buster was natto, a fermented food.

After additional research, he found that that natto contained a potent enzyme named nattokinase (pronounced nah-to-KAI-nase), which had the ability to prevent blood clots from already forming, but also to dissolve blood clots that had already formed.

Since 1980 at least 17 studies on natto and its enzymes have been published in Japan and the USA.

Blood clots, which are composed of sticky protein strands called fibrin that accumulate in blood vessels, have two functions: First, they enable the blood to quickly form clots to prevent loss of blood in the case of a cut or major wound. But their second function causes major problems. If these clots occur within the vessels of the heart, the heart

muscle is starved of needed oxygen and quickly begins to die; the result is either angina or a heart attack. When clots occur in blood vessels supplying the brain, nerve cells die, resulting in a stroke and/or senility.

1784. Takahama, Motohide; Shiraiishi, Atsushi. 2004. Mudage o nakusu tōnyū rooshon. Bihada o tsukuru nattō rooshon [Soy milk lotion that helps to get rid of unwanted body hair. Natto lotion that makes beautiful skin]. Tokyo: Besto Serazu. 207 p. 15 cm. [Jap]\*

1785. **Product Name:** Asahi-brand Mini Natto (Fermented Soy Bean).

**Manufacturer's Name:** Mutual Trading Co. (Importer, Distributor). Made in Japan by Asahi Food Industrial Co., Ltd. (Kobe).

**Manufacturer's Address:** Los Angeles, CA 90013. Lyndhurst, NJ 07071.

**Date of Introduction:** 2004. September.

**Ingredients:** Soy bean.

**Wt/Vol., Packaging, Price:** 5.29 oz. (150 gm) in plastic pack. Retails 3 packages for \$2.39 (2004/09, Lafayette, California).

**How Stored:** Frozen.

**New Product–Documentation:** Label with notes sent by



Martine Liquori. 2004. Sept. 22. Retails for \$0.45/oz. or \$7.20/lb. "This one has smaller pieces that are actually cut up soya beans. The beans are medium dark brown in color. Purchased at Diablo Oriental Foods. They keep it frozen, otherwise it keeps fermenting."

1786. **Product Name:** Hokkaido Mini Natto (Fermented Soy Bean).

**Manufacturer's Name:** Mutual Trading Co. (Importer, Distributor). Made in Japan.

**Manufacturer's Address:** Los Angeles, CA 90013. Lyndhurst, NJ 07071.

**Date of Introduction:** 2004. September.

**Ingredients:** Soybean, water. Seasoning base ingredients: Soy sauce (water, soybean, wheat, salt), sugar, glucose, sweet sake [mirin], vinegar, mustard, salt, bonito extract, chili and L-glutamic acid.

**Wt/Vol., Packaging, Price:** 4.2 oz. (3 x 40 gm) in plastic pack. Retails 3 packages for \$2.10 (2004/09, Lafayette, California).

**How Stored:** Frozen.

**New Product–Documentation:** Label (see next page) with notes sent by Martine Liquori. 2004. Sept. 22. Retails for \$0.50/oz. or \$8.00/lb. Tasty sauce with mustard enclosed. "How can I make my own? Like yogurt—using this as a starter for the next batch?"

1787. **Product Name:** [Okame Natto: Hikiwari].

**Foreign Name:** Okame Nattō: Umaaji Hikiwari Mini-2.

**Manufacturer's Name:** Nishimoto Trading Co. (Importer, Distributor). Made in Japan.

**Manufacturer's Address:** Los Angeles, CA 90058.

**Date of Introduction:** 2004. September.

**Ingredients:** Water, soybean, soy sauce (water, soybeans, wheat, salt), high fructose corn syrup, sugar, extract (kelp, dried shaved bonito), salt, distilled vinegar, MSG, mustard, corn oil, citric acid, guar gum, spice.

**Wt/Vol., Packaging, Price:** 3.17 oz. (90 gm) in plastic tray.



Nutrition Facts	
Serving Size 40gm (1.4 OZ)	Amount Per Serving %DV <sup>2</sup>
Serving Per Container 3	Total Fat 5g 7% Total Carb 6g 2%
Calories 100	Saturated Fat 0g 0% Dietary Fiber 1g
Fat Cal 45	Cholest 0mg 0% Sugars 5g
	Sodium 1mg 0% Protein 8g
Percent Daily Values are based on a 2000 calorie diet.	
Vitamin A 0% • Vitamin C 0% • Calcium 4% • Iron 9%	

SOYBEAN INGREDIENTS: SOYBEAN, WATER, SEASONING BASE INGREDIENTS: SOY SAUCE, (WATER, SOYBEAN, WHEAT, SALT), SUGAR, GLUCOSE, SWEET SAKE, VINEGAR, MUSTARD, SALT, BONITO EXTRACT, CHILI & L-GLUTAMIC ACID.

DISTRIBUTED BY  
**MUTUAL TRADING CO., INC.**  
 Los Angeles, CA 90013 Moonachie, NJ 07074  
 THE CHERRY CO., LTD. NORTH AMERICAN FOOD DIST. CO., INC.  
 Honolulu, HI 96818 W. Sacramento, CA 95691

PRODUCT OF JAPAN  
 KEEP REFRIGERATED

成分表示	
名称	ひきわり大豆、米粉、納豆菌
原材料名	ひきわり大豆、米粉、納豆菌、調味料(アミノ酸等)、着色料(黄色素)、増粘多糖類、植物油、調味料(アミノ酸等)、からし、デンプン、醸造酢、食塩、糖、香料(アミノ酸等)、アルコール、スターチ
内容量	納豆(45g×2) たれ(5.9g×2) からし(0.6g×2)
賞味期限	上面に記載
保存方法	冷蔵庫(10℃以下)に保存してください
販売者	タカノフーズ株式会社(製造所固有記号)上面社名の後 〒811-0411 茨城県東茨城郡小川町野田字大畑1542

おいしいからこの笑顔  
**おがめ納豆®**  
 うまあじ  
**旨味**  
 簡単!便利!  
 味ののびがよい  
 フィルムの替わりに  
 ふたを納豆に密着  
 発酵の均化によって  
 ふっくらもちやみか  
 旨味ある納豆に  
 仕上げました

45g×2  
 この納豆には  
 遺伝子組み換え大豆は  
 使用しておりません。

販売者  
**タカノフーズ株式会社**  
 茨城県東茨城郡小川町野田字大畑1542

4 901160 017555  
 納豆(1パック51.5gあたり)  
 たれ・からし付栄養成分表

エネルギー	96kcal (90kcal)
たんぱく質	7.9g (7.7g)
脂質	4.6g (4.6g)
炭水化物	5.8g (4.6g)
ナトリウム	287mg (1mg)

（ ）内納豆のみ  
 持ちかけフィルム: PP  
 蓋: PS  
 トップシール: PP  
 たれ袋: PEPA  
 からし袋: PE/PET

品質管理には万全を期しておりますが、お気付きの  
 がございましたら、お手数でも返品・苦情・フィルムなど  
 を保留の上、お手持ちの納豆までご連絡ください。  
 お客様相談室 0120-030710 (無料)  
 \*ゴミを出すときは市町村の区分に従ってください。  
 廃棄物の処理は当社が責任を負いません。

ITEM NO. **FERMENTED SOYBEANS**  
 94097 (UMAAJI HIKWARI MIN2)

Nutrition Facts		
Serv. Size 45 g	Amount/Serving %DV	Amount/Serving %DV
Servings 1.58 oz	Total Fat 9g 13%	Total Carb. 10g 3%
Calories 170	Sat. Fat 1g 5%	Fiber 2g 8%
Fat Cal. 80	Cholest. 0mg 0%	Suga. 0g
	Sodium 0mg 0%	Protein 14g
	Vitamin A 0%	Vitamin C 0%
	Calcium 8%	Iron 18%
*Percent Daily Values are based on a 2000 calories diet.		

INGREDIENTS: WATER, SOYBEAN, SOY SAUCE(WATER, SOYBEANS, WHEAT, SALT), HIGH FRUCTOSE CORN SYRUP, SUGAR, EXTRACT (KELP DRIED SHAVED BONITO), SALT, DISTILLED VINEGAR, MSG, MUSTARD, CORN OIL, CITRIC ACID, GUAR GUM, SPICE.

DISTRIBUTED BY NISHIMOTO TRADING CO., LTD.  
 KOBE 651-0084 JAPAN PRODUCT OF JAPAN  
 NET.WT. 3.17 OZ.(90G)

Retails for \$1.89 (2004/09, Lafayette, California).

**How Stored:** Frozen.

**New Product–Documentation:** Label (see previous page) with notes sent by Martine Marechal Liquori. 2004. Sept. 22. Beans are smaller than for Mito Natto (like mung beans) and lighter in color (medium tan). Two little packages enclosed; one is mustard. The dipping sauce makes it tasty but it also has MSG and sugar. “I would skip this one in the future. Also almost double the price of Mito Natto. They retail for \$0.60/oz. which is \$9.60 per pound!”

Note: Hikiwari indicates that the soybeans are split. The package is entirely in Japanese with an English label attached.

1788. Cui, Zhanglin; James, A.T.; Miyazaki, Shoji; Wilson, Richard F.; Carter, Thomas E., Jr. 2004. Breeding specialty soybeans for traditional and new soyfoods. In: KeShun Liu, ed. 2004. Soybeans as Functional Foods and Ingredients. Champaign, Illinois: AOCS Press. xii + 331 p. See p. 264-322. [217 ref]

• **Summary:** Contents: Introduction. Soybean and soyfoods in China: Domestication of soybean, ancient utilization and processing, traditional soyfoods cultivars, current soyfoods markets, modern soyfoods cultivars (cultivars for bean curd {tofu} and soymilk, cultivars for small-seeded soybeans {sprouts, natto}, cultivars for vegetable soybeans {*maodou*}, cultivars for soy sauce, *doujiang*, *douchi*, and medicine, cultivars with improved seed composition).

Soybean and soyfoods in North America: Introduction of soybean, current soyfoods markets, modern soyfoods cultivars, genetic base and diversity of soyfoods cultivars. Soybean and soyfoods in Japan: Introduction of soybean to Japan, traditional soyfoods in Japan, current soyfoods markets, modern soyfoods cultivars (cultivars for tofu {bean curd} and soymilk, cultivars for *miso* {soybean paste}, cultivars for natto {fermented soybean; Japanese cultivars registered with the Ministry of Agriculture, Forestry and Fisheries (MAFF) include Suzumaru, Kosuzu, Natto-shoryu = Natto-Kotsubu}, cultivars for *nimame* {boiled soybean}, cultivars with low allergenic properties).

Soybean and soyfoods in Australia: Current soyfoods markets, modern soyfoods cultivars. Breeding for the soyfoods market: Tofu (environmental influences on tofu yield and solubility of seed dry matter, genotypic effects on tofu yield, seed protein and gelling properties of tofu, seed color, sugar content, undesirable flavors in tofu), natto, *edamame* or *maodou*, soymilk. Designing future soyfoods cultivars: Increasing protein and oil concentration, soybean protein composition (potential for altering protein composition, mutations in 7S storage-protein genes, mutations in 11S storage protein genes, influence of nutrition on storage protein gene expression, association with protein functionality), soybean carbohydrate composition (genetic regulation of oligosaccharide content), soybean fatty acid

composition (genetic modification to reduce saturated fatty acid composition, genetic modification to alter unsaturated fatty acid composition, influence of multiple gene combinations on oil composition), Tocopherols and isoflavones in soybean seed (tocopherols, isoflavones). Summary. Acknowledgments.

Figures: (1) Diagram of two-dimensional representation of genetic relationships among 89 soyfood cultivars derived from a two-dimensional multidimensional scaling (MDS) analysis based on coefficient of parentage. (2) Bar chart of distribution of protein concentration among accessions of the USDA soybean germplasm collection. (3) Bar chart of distribution of oil concentration among accessions of the USDA soybean germplasm collection. (4) Diagram of the stachyose and phytic acid synthetic pathways in soybean. (5) Graph of relation of tocopherol concentrations to C18:3 concentration in mature seed of soybean germplasm with altered linolenic acid concentration, based on germplasm from the population N93-194 x N85-2176. (6) Graph of relation of total isoflavone and protein concentration among soybean cultivars.

Tables: (1) Distribution of releases of 193 public soyfood cultivars developed in China from 1923 to 1995. (2) Origin and description of 193 soyfood cultivars released in China from 1923 to 1995. (3) Distribution of releases of 123 public soyfood cultivars developed in North America from 1956 to 2000. (4) Origin and description of 123 public soyfood cultivars released in North America from 1956 to 2000. (5) Ancestors of North American soybean that contribute to soyfood cultivars but do not contribute significantly to commodity cultivars. (6) Distribution of release of 97 specialty-use public soyfoods cultivars developed in Japan from 1950 to 1995. (7) Origin and description of 97 public soyfood cultivars developed and released in Japan from 1950 to 1995. (8) Cultivars used for soyfood purposes in Australia. (9) Cultivars of Asian origin currently being employed in soyfood breeding in Australia. (10) Desired breeding traits for traditional soyfood cultivars. (11) Ratio of 11S to 7S proteins in seeds of soybean cultivars. (12) Genetic manipulation of soluble carbohydrate concentration in soybeans. Address: 1. North Carolina State Univ., Crop Science Dep., 3127 Ligon St., Raleigh, North Carolina, 27607, USA.

1789. Liu, KeShun. 2004. Edible soybean products in the current market. In: KeShun Liu, ed. 2004. Soybeans as Functional Foods and Ingredients. Champaign, Illinois: AOCS Press. xii + 331 p. See p. 23-51. [76 ref]

• **Summary:** Contents: Introduction. Soybean oil. Traditional soyfoods: Nonfermented soyfoods (soymilk, tofu, variety and current market, nutritional value and health benefits, general processing, soymilk film {yuba}, okara, soybean sprouts, vegetable soybeans, roasted {soynuts} or cooked whole soybeans), fermented soyfoods (fermented soy paste

{jiang and miso}, soy sauce, Japanese natto, tempeh, sufu or Chinese cheese, fermented black soybeans {douchi or Hamanatto}). Soy protein products: Soy flour, soy protein concentrated, soy protein isolate, textured soy proteins. Modern soyfoods. Soy-enriched products. Functional soy ingredients / dietary supplements: Soy lecithin, oligosaccharides, isoflavones, tocopherols, phytosterols, trypsin inhibitors.

Figures: (1) Photo of traditional soyfoods. (2) Photo of soy flour and defatted meal after crushing. (3) Bar chart of U.S. soyfood sales since 1992. (4) General flow chart of processing soybeans into various edible products. (5) Flow chart of a traditional Chinese method for making soymilk and tofu. (6) Bar chart of U.S. tofu sales since 1980.

(7) Photo of natto, a fermented Japanese soyfood. (8) Flow chart of natto production outline. (9) Photo of soy protein products. (10) Photo of meat analog made by high-moisture extrusion of soybean protein. (11) Photo of new generation of soyfoods in the market. (12) Photo of soy-enriched bakery products. (13) Photo of concentrated soy isoflavone product.

Tables: (1) Classification of various edible soy products in the current market. Address: Univ. of Missouri, Columbia, Missouri.

1790. **Product Name:** Soy Natto: Tropical Flavor Baked Energy Bar.

**Manufacturer's Name:** Soy Natto Food Co. (Importer-Distributor). Made in Japan.

**Manufacturer's Address:** 1015 East Howard Ct., Visalia, CA 93292. Phone: 559-679-9699.

**Date of Introduction:** 2004. October.

**Ingredients:** Brown rice syrup, Energy Smart (fruit juice, natural grain dextrin), rolled oats, baby rolled oats, natto, rice flour, raisin paste, dried apples, barley malt, brown crisp rice, dried apricots, dried pineapple, natural flavors, banana puree, sea salt.



**Wt/Vol., Packaging, Price:** 2 oz (56 gm) in foil pouch. Retail for \$2.79.

**How Stored:** Shelf stable.

**New Product–Documentation:** Product with Label sent by Mike Masuyama, PhD, of Visalia. 2006. June. 6 by 2 inches foil pouch. On the front panel is a color cartoon of Natto Boy, a soybean, with a smiling mouth, eyes, glasses, 2 hands, and 2 feet. A pink Hawaiian lei hangs around his “neck” (held up by the back of his glasses). Also: Two sell-sheets: (1) “Natto up-date.” 2005. Jan. (2) “New generation soy food–Natto Boy products.” “The world’s first Natto energy bar.” “Natto has a distinct fermented smell and sticky texture. The characteristic smell is similar to that seen with bacterial surface aging cheeses such as Limburger from Belgium, Liederkrantz, Brick, or Monterey from the US, St. Paulin or Brie from France, Muenster from Germany and Bel Paese from Italy.” In 1980 Dr. H. Sumi at the University of Chicago discovered that the sticky portion of natto “contains functional properties such as antigens and Nattokinase.”

Soyfoods Center taste test: Delicious flavor, excellent texture and appearance.

1791. GEM Cultures. 2004. Catalog [Mail order]. 30301 Sherwood Rd., Fort Bragg, CA 95437-4127. 10 p. Undated. [4 ref]

• **Summary:** Contents: Greetings from Northern California. Soycrafters section: Powdered tempeh starter, natto starter, koji starters, fresh koji, seed miso, tofu boxes [kit], coagulants. Bread and crepe cultures: Cultured crepes, cool rise natural leaven, rice or rye sourdough. Dairy cultures: Fil mjolk (subs for piima), viili, kefir. Tea fungus–kombucha. Kitchen items: cheesecloth, super sealers. Ordering information. Address: Fort Bragg, California. Phone: 707-964-2922.

1792. Battacharyya, Sourish. 2004. HT city eating out guide: Delhi, Gurgaon, Noida, Faridabad, Ghaziabad. New Delhi, India: HT Media Ltd. Distributed by India Book House. 322 p. See p. 96. 22 cm.

• **Summary:** HT stands for “Hindustan Times.” Page 96 states that *Akhuni* is a preparation of fermented soybeans. Address: Hindustan Times Ltd.

1793. Fukuda, Yoshiko. 2004. Genki ga deru nebaneba pawa reshipi [Sticky power recipes to bring forth your energy and health]. Tokyo: Ie no Hikari Kyokai. 95 p. 21 cm. [Jap]\*

1794. Kiuchi, Kan; Watanabe, Sugio. 2004. Industrialization of Japanese natto. In: Keith H. Steinkraus, ed. 2004. Industrialization of Indigenous Fermented Foods. 2nd ed. Revised and Expanded. New York, NY & Basel, Switzerland: Marcel Dekker. xix + 796 p. See p. 193-246. Chap. 4. [142 ref]

• **Summary:** Contents: Introduction–Description and history

of natto: Raw materials, natto in East Asia (History of natto, natto in China {*douche*} [*doushi / douchi*], natto in Japan {*itohiki-natto*, cracked natto, *yukiwari-natto*, barley natto, salted natto, dried natto, *soboro-natto*, how natto is used in foods}, *tua'nao* [*thua-nao*, *tua nao*] {incl. *pe-pok* in Myanmar and *tau'si* in Laos}, *kinema*, *chongkuk-jung*, *dawadawa* [the starters for these products are *Bacillus subtilis*], making of natto in the home).

Production and consumption. The fermentation process. Materials used for traditional and modern natto production. Modern manufacturing methods: Storage of raw soybeans and purification process, processes of washing and soaking, steaming and inoculation processes, natto-filling process, fermentation process, refrigeration and aging process, second packaging and shipping processes.

Change from traditional process to modern manufacturing process: Cultivation and storage of raw soybeans (traditional, modern), selection. washing and soaking, steaming and inoculation, filling, fermentation, first refrigeration, packaging, second refrigeration. Critical steps in the manufacture and fermentation of natto. Important problems in the industrialization of natto: Soaking, steaming, filling, fermentation Optimum conditions for fermentation: Initial stage of fermentation (lag phase), middle stage of fermentation (log to stationary phases), latter stage of fermentation (death phase). Microbiology and biotechnology: Determinative or systematic characteristics of natto bacilli, difference between natto bacilli and other *B. subtilis* as natto starters, enzymes and other materials produced by natto bacilli. Other aspects of the microbiology of natto: Phages of natto bacilli, plasmids of natto bacilli. Chemical and biochemical changes during fermentation: Soybean characteristics on steaming, relationship between the components of natto and those of soybeans, changes in soybean constituents during fermentation (carbohydrates, fatty acids, organic acids and other volatile components), size of soybeans, steaming condition. Starter cultures: Marketed starters, development of new starters. Contains 26 figures.

In 1999 in Japan, about 130,000 metric tons per year of soybeans are used to make about 260,000 tons of natto or 5.20 billion 50-gm packages worth 160.5 billion yen. Approximately 500 companies make natto in Japan, but the 10 largest companies account for 85% of total production.

Concerning *hikiwari natto* (cracked natto) (p. 195): Parch soybeans than crack them into 3-4 pieces for use as a raw material, instead of whole soybeans, for making natto (*itohiki natto*). Cracking reduces the soaking time to 3-4 hours.

Concerning *yukiwari natto* (p. 195): It is one of the trade names of “Barrel natto” and a special product of Yamagata prefecture, located in northeastern Japan. To make it at home or on a small commercial scale, mix 18 kg cracked natto, 9 kg of rice koji, and an appropriate amount of salt in a large

wooden barrel. Allow it to ferment until ripe.

Note 2. This is the earliest English-language document seen (Jan. 2012) that uses the term “tua-nao” to refer to *thua-nao*. Address: 1. Kyoritsu Women’s Univ.; 2. Biotechnology Inst. of Natto, Suzuyo Kogyo Co. Ltd. Both: Tokyo, Japan.

1795. Nattô de yarikuri reshîpi: aidea mansai. Zenreshîpi nedan o hyôji [Budget recipes using natto: Full of ideas. All recipes include prices]. 2004. Tokyo: Gakken. 81 p. 26 cm. [Jap]\*

1796. Nattô rooshon ando nattô sekken [Natto lotion and natto soap]. 2004. Tokyo: Shufu no Tomo-sha. 66 p. 26 cm. [Jap]\*

1797. Seo, Yukiko. 2004. Ketteiban tôfu, nattô aburaage [Definitive recipes for tofu, natto, deep-fried tofu pouches]. Tokyo: Shufu no Tomosha. 207 p. Illust. (color). 24 cm. [Jap]\*

1798. Shiraiishi, Atsushi. 2004. Hada ga uruô nattô rôshon [Moisturizing skin, natto lotion]. Tokyo: Makino Shuppan. 79 p. 29 cm. [Jap]\*

1799. Steinkraus, Keith H. ed. 2004. Industrialization of indigenous fermented foods. 2nd ed. Revised and expanded. New York, NY & Basel, Switzerland: Marcel Dekker. xix + 796 p. Illust. Pseudo-Index. 24 cm. Series: Food Science and Technology No. 136. [508 soy ref]

• **Summary:** This book contains the following chapters on soyfoods: 1. Industrialization of fermented soy sauce production centering around Japanese shoyu, by Danji Fukushima. 2. Industrialization of Japanese miso fermentation, by Hideo Ebine. 4. Industrialization of Japanese natto, by Kan Kiuchi and Sugio Watanabe (incl. *yukiwari-natto*, a special product of Yamagata prefecture, p. 196). 11. Industrialization of tempeh fermentation, by Kapti Rahayu Kuswanto. 12. Tempe production in Japan, by Michio Kozaki. It also contains chapters on the industrialization of the production of sake, *tapai*, African beers, *magehu*, *ogi*, *gari*, Mexican pulque, Thai fish sauce (*nam pla*), Thai fermented fish and related products, and Myanmar fish paste and sauce.

The final chapter is titled “Industrialization of indigenous fermented food processes: Biotechnological aspects.”

Soy-related chapters are also cited separately.

Note: Cornell Prof. Emeritus Keith H. Steinkraus died on 13 Nov. 2007 at age 89. He was a specialist in indigenous fermented foods and food microbiology. Address: Inst. of Food Science, Cornell Univ., Geneva, New York.

1800. Watanabe, Aya. 2004. Nattô bôya [Natto boy]. Tokyo: Gakushu Kenkyujo. Unpaginated. Illust. (color). 25 x 22 cm.

[Jap]\*

• **Summary:** Juvenile fiction. Natto boys are singing and dancing. This is the story of delicious, enjoyable natto—a fermented soyfood. Address: Japan.

1801. Yuki, Goro; Takabe, Haruichi 2004. *Nattô* [Natto]. Tokyo: Kadokawa Haruki Jimusho. Unpaginated. Illust. (color). 23 cm. [Jap]\*

• **Summary:** Juvenile fiction. A woman who sells natto passes by our house at about the same time every day. But one day I noticed that the tone of her voice had dropped. Address: Japan.

1802. Huang, H.T. (Hsing-Tsung). 2005. Re: Natto in China and Japan. Letter (e-mail) to William Shurtleff at Soyinfo Center, Jan. 29. 1 p.

• **Summary:** Dr. Huang prefers to define natto as “the product of the fermentation of soybeans with bacillus natto.” “As I see it, natto is probably a Japanese invention, unless you can show that it came to Japan by transfusion from SE Asia.”

“There is no record of a soybean-Bacillus fermentation in the classical or modern records in China.” Address: PhD, Alexandria, Virginia.

1803. **Product Name:** Soy Natto: Natto Boy Powder.

**Manufacturer’s Name:** Soy Natto Food Co. (Importer-Distributor). Made in Japan.

**Manufacturer’s Address:** 1015 East Howard Ct., Visalia, CA 93292. Phone: 559-679-9699.

**Date of Introduction:** 2005. January.

**Ingredients:** Soybeans, *Subtilis natto* [sic, *Bacillus subtilis natto*].

**Wt/Vol., Packaging, Price:** 8.8 oz (250 gm) in cylindrical plastic bottle.

**How Stored:** Shelf stable.

**New Product–Documentation:** Product with Label sent by Mike Masuyama, PhD, of Visalia. 2006. June. 3.75 inches high by 3.75 inches in diameter. On the front panel is a color cartoon of Natto Boy, a soybean, with a smiling mouth, eyes, 2 hands, and 2 feet. He is wearing a baseball cap; in his left hand he holds a baseball bat. Also: Two sell-sheets: (1) “Natto up-date.” 2005. Jan. (2) “New generation soy food–Natto Boy products.” This product is “All powder: All high-quality natto properties retained. Use for mixing into shakes or for sprinkling over foods. 1 tablespoon (10 gm) per serving.” Contains a one-month supply.

1804. Warmuth, Manfred. 2005. Efficient tempeh making. Santa Cruz, California. 6 p. Unpublished typescript. Sept. 21. [1 ref]

• **Summary:** Manfred, after more than 6 years of working to develop better ways of growing tempeh at home, has made major improvements on the method for making tempeh

at home as given in *The Book of Tempeh*, by Shurtleff and Aoyagi. These are: Crack 1½ lb dry soybeans using a Champion juicer or grain mill. Put cracked beans and hulls in a hemispherical bowl. Remove the hulls outdoors by blowing / winnowing with a blow dryer (used to dry hair). Soak. Pressure cook for 20 minutes with ½ cup warm water, 2 tablespoons vinegar and 1 cup dry millet. Add 1 teaspoon of *Rhizopus oligosporus* spores and mix with an egg beater. Fill into a pan, spread evenly, compact slightly.

Prepare the incubator, which is a plastic tub, filled to a depth of several inches with water, heated with an aquarium thermometer. Float pan of inoculated soybeans on water, then cover incubator with plastic cover. Keep water temperature at 32°C = 85°F. Insulate if ambient temperature is low. Incubate for about 26 hours. Flip tempeh out of pan onto cutting board. Cut into pieces. Store in fridge for a week or in freezer for months. For details, Google: efficient tempeh making manfred, or manfred@cse.ucsc.edu.

Note: As of May 2011: Manfred is “UCSC professor of Computer Science with a wide range of hobbies: bee keeping, growing natto, tempeh, onchom, miso, mushrooms, fruit trees, spirulina, meat rabbits. I try to learn new skills and pass them on to others.” Address: Professor, E2, Dep. of Computer Science, Univ. of California, Santa Cruz, California 95064.

1805. Downey, Tom. 2005. A two-day tour of Tokyo, stretching \$500 worth of yen. *New York Times*. Sept. 11. p. D11.

• **Summary:** Foreigners seem to think Tokyo is so expensive, but it’s not—if you know where to go and what to avoid. The writer enjoyed dinner at the Milk Wonton, in Yurakuchō; it “serves some challenging fare for the Western eater—things like grilled eel fin twirled on a stick, natto (fermented, stinky soybeans) and sticky yam—but these foods are well worth sampling.”

1806. Shurtleff, William; Aoyagi, Akiko. 2005. *Doufu zhi shu* [The book of tofu]. Taipei, Taiwan: Persimmon Cultural Enterprise Co., Ltd. viii + 270 p. Sept. 1. Illust. by Akiko Aoyagi. No index. 26 cm. [Chi]

• **Summary:** A very attractive, complex character, Chinese-language edition of *The Book of Tofu* (2nd ed. Ten Speed Press). Address: 1. Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

1807. **Product Name:** Natto-Clear.

**Manufacturer’s Name:** Institute for Vibrant Living. A Div. of NaturMed, Inc. (Marketer-Distributor).

**Manufacturer’s Address:** P.O. Box 3840, Camp Verde, AZ 86322. Phone: 928-567-7854.

**Date of Introduction:** 2005. October.

**Ingredients:** Nattokinase.

**Wt/Vol., Packaging, Price:** 90 capsules (1 month supply)

## New Generation Soy Food *Natto Boy Products*

### - Fermented Soy Beans : "Natto", Dried Products -

**Natto Boy** products are dried products derived from fermented soy beans. The fermentation of soy beans enhances flavor and nutritional value. It also adds functionalities to soy while reducing the few negative properties known to exist in this healthy food. Natto has been regarded as responsible for the good health and longevity seen in Japanese. Natto is currently receiving enthusiastic attention due to its natural enzyme, Nattokinase. Nattokinase has been demonstrated to prevent and dissolve blood clots that may cause blockage of arteries, heart attacks, strokes and contribute to senile dementia. In addition, Natto is eagerly sought by those who seek prevention and remedy for other health troubles through improved diet and lifestyle. (Refer to "Natto Up-Date" January, 2005)

Our **PRODUCT DEVELOPMENT** seeks to improve the taste and increase the availability of diverse Japanese food products for those not accustomed to these traditional foods in their diet. Our **TECHNOLOGY** provides the finished product's high degree of nutritional value and physiological functionalities which are often lost in the conventional manufacturing processes or with high heat drying or oil-frying. Our finished products maintain long shelf lives without the need for refrigeration. Our **MARKETING** strives to assure the availability of these products as true foods but not simply as supplements of isolated, concentrated constituents. We back up our products with supporting literature for those who expect healthful products in their diets. **Natto Boy** products are a new generation of soy foods and a good choice for the health and natural food conscious consumers.

#### Product

Non GMO ingredients used and No MSG added.

Product of Japan

**Natto Boy Snack Nuts** : Dried Natto snack nuts with roasted soy beans

1.06 oz (30 g), 1 package per serving

**Plain** ; good for children through seniors

**Sea salt & White Soy Sauce** ; with unique white soy sauce &

**Spirit of the Sea** high mineral sea salt

**Curry** exotic, Oriental flavor

**Natto Boy Toppers** : Natural salad & food topping of dried Natto with dried vegetables and sea vegetables.

Good for toppings over pasta, soups, steamed rice, pizza

1.06 oz (30 g), 1tbsp (5 g) per serving

**Natto Boy Energy Bar Tropical Flavor** : The world's first Natto energy bar,

All natural intermediate moisture food

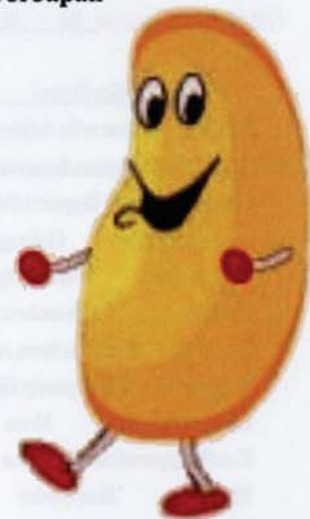
2 oz (56 g), 1 package per serving

**Natto Boy Powder All-Power** : All high-quality Natto properties retained.

Use for mixing into shakes or for sprinkling over foods.

1 tbsp (10 g) per serving

8.8 oz (250 g) : one monthly Natto supply





## Natto Fermentation and Health

Fermentation is a process involving the energy generation, body building and reproduction of microorganisms. At the top of the food chain, human utilizes fermentation processes primarily for preservation of food. We use fermentation by specifically targeting beneficial microorganisms and allow them to convert raw foods to fermented products, preventing further spoilage due to growth of undesirable microbes. Fermentation of foods also brings about many beneficial effects such as an increase in palatability, nutrition and physiological functions, at the same time decreasing unfavorable components and functions. Cheese, Kefir, yogurt and other dairy products, pickles, some sausages, wine, and beer are among the other examples of fermented foods and beverages which have been staples in our diet for many centuries.

Natto has a distinct fermented smell and sticky texture. The characteristic smell of Natto is similar to that seen with bacterial surface aging cheeses such as Limburger from Belgium, Liederkranz, Brick., or Monterey from the US, St. Paulin or Brie from France, Muenster from Germany and Bel Paese from Italy. The sticky texture of Natto is similar to chopped okura or melted Mozzarella cheese. In 1980, Dr. H. Sumi at the University of Chicago has determined that this sticky portion contains functional properties such as antigens and Nattokinase. This particular fermentation increases the nutritional and physiological functions of soy beans and also removes or reduces some of the undesirable properties of soy beans. Natto has a pleasant taste, improved nutrition and improved digestibility and has greater health effects compared to soy beans.

## Comparison of Natto with Soy Beans

	Per serving or Unit	Cal	Moisture	Protein	Fat	Sugars	Dietary Fiber
Soy Beans	10g	43 Cal	12%	3g	2g	3g	less than 1g
Natto (Fresh)	50	100	60	8	5	5	1
NB Snack Nuts Plain	30	130	5	11	7	8	4
NB Toppers	6	40	5	1	1	3	less than 1
NB E. Bar Tropical F.	56	190	15	5	2	17	2
NB All Power Powder	10	46	6	4	2	3	2

	Soy Beans	Natto
Protein	Often with deficiency of S-amino acids	Amino acid composition improved by fermentation
Carbohydrates	Gas formation from melibiose	Less gas formation
Growth inhibitor	Trypsin inhibitor; haemagglutinin	Fermentation reduces or deactivates
Thyroid function	Goitrogens	Reduced goitrogens
Nattokinase	No activity	Activity (1600 IU per g)
Phytate	High content	Reduced by fermentation
Genistein	Genistin form, not bio-available	30 mg, 5 times more bio-available
Digestibility	Often poorly digested	Improved by fermentation
Probiotic function	None	Probiotic due to beneficial microorganisms
E. coli suppression	None	Suppresses pathogenic coliform 0157:H7
Flavor	Beany odor	Fermented smell
Nutrition	Good	Improved, elevated vitamins f(Vit. B2, K etc.)
Texture	Often hard to chew	Easy to chew

For further info. and contact : [www.soyatto.com](http://www.soyatto.com)

Soy Natto Food Company 1015 E. Howard Ct., Visalia, CA 93292

FAX 559-739-1972 [info@soynatto.com](mailto:info@soynatto.com) [info@snattoboy.com](mailto:info@snattoboy.com)

for \$59.95 plus \$6.95 shipping and handling.

**How Stored:** Shelf stable.

**Nutrition:** -

**New Product–Documentation:** Packet of promotional materials sent to Prof. Ted Hymowitz. 2005. Oct. (1) “How you can prevent heart attacks and strokes for life? Tap into the 1,000 year old ‘young-blood’ secret from the people with the highest longevity rate in the world.” Says that nattokinase has been the subject of 17 studies, including two small human trials. (2) “We stand behind Natto Clear—and so do our customers.” Testimonials. (3) “Enjoy the youthfulness of thin clear blood.” Order form. (4) “What’s the 1,000 year-old longevity secret most doctors never heard of?” (5) “1 out of 4 Americans will die from heart disease, but not you.” Natto-Clear “has proven to be the world’s most powerful, all-natural blood-clot dissolving agent.”

1808. Shurtleff, William; Aoyagi, Akiko. 2005. *Wei ceng zhi shu* [The book of miso]. Taipei, Taiwan: Persimmon Cultural Enterprise Co., Ltd. 280 p. Nov. 14. Illust. by Akiko Aoyagi. No index. 26 cm. [Chi]

• **Summary:** A very attractive, complex character, Chinese-language edition of *The Book of Miso*. Address: 1. Soyfoods Center, P.O. Box 234, Lafayette, California 94549.

1809. *New York Times*. 2005. Dried vaccines. Dec. 6. p. F6.

• **Summary:** Aktiv-Dry, a Colorado company that turns liquids into superfine powders, is developing a measles vaccine that can be stored dry and inhaled. It is very difficult to keep vaccines cold in Third World villages without refrigeration. Yet each year, “23 million children in Africa and Asia get measles, and 1 million die of it.” The chosen vehicle for the vaccine is *Bacillus subtilis*, which is found in dirt all over the world. Safety is not an issue, since many Japanese eat it daily for breakfast. “The bacteria are used to ferment soybeans for a dish called natto.” Illustrations show the inhalator and how it works.

1810. Tamang, Jyoti Prakash. 2005. Food culture of Sikkim. In: M.P. Lama, K.C. Pradhan, E.E. Guruna, A.P. Lama, S. Dipaka, eds. 2005. Sikkim Study Series, Vol. 4. Information and Public Relations Department, Government of Sikkim, Gangtok, Sikkim, India. [Eng]\*  
Address: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1811. Tamang, Jyoti Prakash. 2005. Ethnic fermented foods of the Eastern Himalayas. In: Proceedings of the Second International Conference on “Fermented Foods, Health Status and Social Well-Being.” Organized by Swedish South Asian Network on Fermented Foods and Anand Agricultural University, Anand, Gujarat, India. Held 17-18 Dec. 2005. [Eng]\*

Address: Food Microbiology Lab., Sikkim Government

College, Gangtok, Sikkim 737 102, India.

1812. Tamang, Jyoti Prakash. 2005. Carrying capacity study of Teesta Basin in Sikkim. In: Vol. 7, Food Resources: Edible Wild Plants and Ethnic Fermented Foods. Final Project Report in Collaboration with South Campus-Delhi University, New Delhi. [Eng]\*  
Address: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1813. Gulia, Kuldip Singh. 2005. Human ecology of Sikkim: a case study of the Upper Rangit Basin. Delhi, India: Kalpaz Publications. 304 p. See p. 74, 148, 193, 195, 198, 237. Illust. Maps. 23 cm. [60+ ref]

• **Summary:** On page 74 is a table titled “Indigenous fermented foods of the Sikkim Himalaya.” One of the common fermented foods is kinema, of which soybean is the substrate. “Nature and use: Cooked soybeans showing stickiness with typical flavour, side dish.” Kinema is also mentioned on p. 148.

Page 195: “Kinema is an indigenous fermented soybean food which serves as a sustainable,” low-cost source of protein in the local diet. Kinema curry is delicious local dish, eaten with boiled rice.

Synonyms of “kinema” in nearby local languages are: *Kinemba* (Limbu). *Hokuma* (Rai). *Bari* (Bhutia). *Satlyangser* (Lepcha).

Note 1. This is the earliest document seen (Jan. 2012) that mentions “Kinemba,” the name used by the Limbu ethnic group, or “Hokuma,” the name used by the Rai ethnic group, for Nepalese kinema, a close relative of Japanese natto.

Products closely resembling kinema include: *Hawaijar* (Manipur in North-East India [NEI]). *Bekang-um* (Mizoram in NEI). *Troombai* (Meghalaya in NEI). *Akhoni* (Nagaland in NEI). *Itohiki-natto* (Japan). *Tooa-nao* [*Thua-nao*] (Northern Thailand). *Chungkook-jang* (Korea).

Page 198: *Vatamas ko achar* is a pickle whose main ingredient is soybean. Address: New Delhi, India.

1814. Hellmiss, Margot. 2005. *Mit Soja durch die Wechseljahre* [Using soy through the menopause years]. Munich, Germany: Suedwest Verlag. 96 p. Illust. (color). Index. 20 x 18 cm. [Ger]

• **Summary:** An attractive book, with many fine color photos on glossy paper. Contents: Soybeans—Tradition and history (Healing plant from China): Productive source of protein, tofu—quark with a longer tradition, triumphal procession around the world, great economic significance, soya and genetic engineering. Fundamental changes of the menopause years (What happens during these years?): Hormonal changes, the right attitude helps, the new understanding of women, many hormones influence the body, men also experience menopause, questionable preparations, Hormone

Replacement Therapy—Pros and cons. Natural help from soy isoflavones (remarkable phytoestrogens): The active agent of plant hormones, the effectiveness of isoflavones, natural SERMs, safeguard against osteoporosis, estrogen protects the circulatory system, soy hormones as free-radical catchers, the end of hot flashes, strong powers of resistance and smooth skin, isoflavones will take good care of you.

Soyfoods that contain isoflavones (A great variety): Whole dry soybeans, soymilk, tofu, soy oil, soy flour (*Sojamehl*), soy flakes (*Sojaflocken*), soy bran (*Sojakleie*), tempeh, natto, soy granules, soy sauce, shoyu and tamari, miso, lignans. Soybeans: A powerful package for your health (Plant protein as an alternative): Indispensable protein, lecithin, minerals, B vitamins for strong nerves, vitamin E—the fountain of youth. Recipes for enjoying soya (Basic recipes): Hors d'oeuvres and salads, soups, pasta, main dishes, sauces, dips, and bread spreads, mueslis, desserts, and baked goods, beverages.

1815. Kim, Yol-kyu. 2005. *Uncovering the codes: Fifteen keywords in Korean culture*. Translated by Jung Ha-yun. Fremont, California: Jain Pub. Co. x + 172 p. 23 cm.

• **Summary:** A marvelously perceptive book that shows the profound influence of culture on all human actions—even the smallest. Each “keyword” is a little jewel of cultural insights. One of the fifteen keywords is “food.”

Page 26: *Chongguk-jang* is a strong-smelling fermented soybean product.

Note 1. This is the earliest English-language document seen (Jan. 2012) that uses the word “chongguk-jang” to refer to Korean-style natto. It can be spelled in various ways, including *cheongguk-jang*.

Page 29: Some people enjoy “ripe blue cheese, but cannot stand the smell of *cheongguk-jang*, a potent Korean” fermented soybean product.

Note 2. This is another way to spell Korean-style natto.

Page 31: “We might say that *doenjang* is the Korean equivalent of cheese.”

Note 3. This fermented soybean product could be called Korean jang or Korean miso.

On the dust jacket: This book “is a cultural guide to what is unique about Koreans and their way of life. The questions raised in this book range from the mundane to the spiritual, each touching on the essence of Korea’s 5,000-year-old culture: Why is a Korean spoon flat and round, not oval? Why do Korean women pray to a bowl of water? Why do Koreans eat dog meat?”

1816. Moriyama, Naomi; Doyle, William. 2005. *Japanese women don’t get old or fat: Secrets of my mother’s Tokyo kitchen*. New York, NY: Delacorte Press. 274 p. Illust. Index. 22 cm. [50+ ref]

• **Summary:** From the publisher’s description: “Japanese-born Moriyama reveals the key to the enduring health and

beauty of Japanese women. The Japanese eat one of the most delicious, nutritious, and naturally satisfying cuisines in the world without denial, without guilt, and, yes, without getting fat or looking old. If you think you’ve eaten Japanese food, you haven’t tasted anything yet. Japanese home-style cooking isn’t just about sushi and raw fish but good, old-fashioned everyday-Japanese-mom’s cooking that’s stood the test of time—and waistlines—for decades. Reflected in this are the age-old traditional values of family and the abiding Japanese love of simplicity, nature, and good health. It’s the food that millions of Japanese women eat every day to stay healthy, slim, and youthful. Even better, it’s fast and easy. If you’re tired of counting calories, counting carbs, and counting on diets that don’t work and don’t satisfy, it’s time to discover this.”

Traditional Japanese soyfoods are mentioned throughout this book, always in a very positive way and in recipes. Japanese generally eat soyfoods in their more natural and less processed forms such as tofu, miso, natto, and edamame—and rarely in the forms of soy supplements, soy shakes, soy burgers, soy energy bars, etc. that are so popular in the West.

Chapter 5, “The seven pillars of Japanese home cooking,” states (p. 122) that they are: “fish, vegetables, rice, soy, noodles, tea and fruit.” Soy, “The fourth pillar,” is discussed very nicely on pages 181+.

Here is the number of pages on which various foods are mentioned: Tofu 56 (incl. silken tofu {kinugoshi}, cotton tofu {momen, regular}, atsu-age {deep-fried tofu cutlets}, usu-age {deep-fried tofu pouches}, yakidofu or broiled tofu). Miso 50 (incl. p. 91-92. 99-100). Soy sauce 50. Edamame 12. Shoyu 3 (p. 75, 114, 121). Natto 2 (p. 184, 188). Okara 1 (p. 184). Yuba 1 (p. 184). Also many reference to sea vegetables (hijiki, kombu, nori). A photo on the inside rear dust jacket shows the authors; she was born in Tokyo, and he is an American who has written or cowritten five books.

Note: The paperback edition of this book (only) mentions “The Japanese Skincare Revolution: How to Have the Most Beautiful Skin” in connection with tofu. Address: Wife and husband live in New York City.

1817. Nattô ando tenpe shokudô honjitsu kaiten: wagaya no shokutaku niwa itsumo nattô ga aru [Opening the Today Natto and Tempeh restaurant: Natto is always on our dining table]. 2005. Tokyo: Gakken. 81 p. 26 cm. [Jap]\*

1818. Nattô ryôri: omoigakenai nattô no tabekata o shokai. Nebaneba pawaa de motto kenkô ni [Natto cookery: Introducing some unusual ways of eating natto. Becoming healthier by sticky power]. 2005. Tokyo: Butikkusha. 48 p. 19 cm. [Jap]\*

1819. Park, Kun-Young; Jung, Keun-Ok. 2005. *Fermented soybean products as functional foods: Functional properties*

of doenjang (fermented soybean paste). In: John Shi, C.-T. Ho, and F. Shahidi. 2005. *Asian Functional Foods*. Boca Raton, Florida: CRC Press. xxi + 647 p. See p. 555-96. Chap. 20. [121 ref]

• **Summary:** Contents: Introduction. History of Korean soybean fermented foods. Manufacturing methods and characteristics of doenjang fermentation. Functional properties of doenjang: Nutritional and functional components in soybean and doenjang, safety of doenjang, antimutagenic activity of doenjang. Anticancer effect of doenjang. Increased chemopreventive effect of doenjang: Antioxidant effects, reduced cardiovascular diseases (fibrinolytic effect {as in chungkookjang and natto which secrete strong fibrinolytic enzymes}, antihypertensive effects, reduced serum cholesterol level), other possible functions of doenjang. Conclusion.

Doenjang is “Korean fermented soy paste” and kanjang is Korean-style fermented soy sauce that is obtained by filtering off the liquid from doenjang. “Historically soybeans and processed soybean foods have been the main protein sources in the Korean diet” (p. 555). “The medicinal functions of doenjang were first described in the *Donguibogam* [*Dongui Bogam (RR), Tongui Pogam (MR)*] (1613 A.D.), which was a popular traditional Korean medical text” [no citation given].

The section titled “History of Korean soybean fermented foods” contains what promises to be a number of references to early and possibly very interesting documents that mention soybeans and soyfoods in Korea. Yet the authors fail to cite any of them properly, so for the time being, we must accept their account of what the documents say. The problems are: (1) None of these documents (except one, Ref. #46) is cited in the long list of references at the end of the chapter. (2) The title of all these documents is given only in Korean, even though at least two should have Chinese titles; one of those two (described as “The Chinese agricultural technology book, *Jeminyosul* {A.D. 530 to 550} written by a governor, Maeunsa,...”) is actually the famous *Qimin Yaoshu*, by Jia Sixie. (3) We are never told in what language the original document referred to is written. (4) The page number(s) on which the ancient, important information appears is not given for any of these documents. (5) For some documents no date is given, whereas for others no author is given. (6) It is not clear what names were used to refer to each of the various soyfoods in the original documents. (7) The authors never tell us whether they examined the original document, or read a contemporary version, or simply got the information from a secondary source.

For example (all dates are A.D.): 99–It has been reported [by what document?] that soybeans were cultivated–Where were they cultivated?

530-550–The *Jeminyosul* [*Qimin Yaoshu*] states (in Chinese) that shi [fermented black soybeans], soybeans fermented with bacteria, in Korea were disseminated to

China and Japan.

683 Feb.–An article [no title given] by King Sinmoon, that appeared in the 3rd year of his reign (during the Silla dynasty), mentioned the words *jang* (mold-fermented soybeans) and *shi* (bacteria-fermented soybeans).

701–*Daebuyulryong* mentioned the words *jang*, *shi*, and *maljang*, which referred to soybean products.

739–*Jungchang Wonmooseu* also mentioned the word *maljang*.

*Donga* (no date given), which was written by Shinjungbaesuk (is that the writer’s real name?) in Japan, “indicated that *maljang* was imported from Korye (the old name of Korea);” it was renamed “miso” (Source: Ref. #46–35th Chronicle of Korea Soy Sauce Industrial Cooperative. 1997. Seoul. p. 27-32). Korean *jang* is said to have developed into traditional Japanese miso using *meju* made of soybeans and rice instead of *maljang*, which was made from soybeans only.

918-1392–During the Korye [Goryeo] dynasty, [in Korea] the name “*maljang*” changed to “*maejyo*” and then to “*meju*” [meaning soybean koji in the shape of balls or cones]; it was soaked in brine in a clay pot and ripened [then filtered]. The liquid was called *kanjang* (soy sauce) and the solid sediment was called *doenjang* (soy paste).

1613–*Donguebogam* [see above], written by Hurjun, described how to make medicinal doenjang using soybeans and how to fix soured doenjang.

1760–*Jungbosan Limkyunge*, written by Yojungim, “introduced 45 different processing methods for soybean foods, describing how many days fermentation for *jang*, selection of water, salt quality, how to handle the pottery, fixing *jang* with an off-taste, etc.”

1790 ca–*Kyuhap Chongseo*, written by Madam Lee (lived 1759-1824) described the proper methods for making the various types of *jang* in great detail.

1930 ca.–Commercial production of fermented soybean products (“*jang*” in Korean) started in Japanese-built *jang* factories in Korea during the occupation (1909-1945) to supply soybean products for the Japanese in Japan.

1945–After gaining independence from Japan, Koreans took over the factories. Since the Korean war (1950-1953) military personnel and people living in large cities have mostly consumed commercial fermented soybean products, whereas families living in rural areas still prepare their own. Address: Pusan National University, Busan, Korea.

1820. Sharma, Suresh Kant; Sharma, Usha. 2005. *Discovery of north-east India: geography, history, culture, religion, politics, sociology, science, education and economy*. 11 vols. New Delhi, India: Mittal. See Vol. 8, “Mizoram,” p. 234. Illust. 23 cm. \*

• **Summary:** Page 234: Pot be kang and soya bean are mentioned. Address: New Delhi, India.

1821. Gandhi, A.P. 2006. The 'greater bean': Scientists continue to find new food and industrial uses for soybeans. *World Grain* 24(2):59-62. Feb.

• **Summary:** About 70% of world soybean production is crushed to make oil and meal, 20% is used directly for food, and the rest for seeds. Soybean meal used for human food "must be devoid of residual solvents that may cause various psychological disorders in humans. The International Standard Organization (ISO) recommends a maximum level of 50 parts per million (ppm) of residual hexane, which is used in the solvent extraction process."

A pie chart shows world soybean production in 2004.

1822. Nihon Keizai Shinbun. 2006. Honda Trading to launch diet supplement business on natto-based product (News release). Japan. 1 p. March 1.

• **Summary:** Honda Trading Corp. "said Tuesday it was launching a dietary supplement business based on nattokinase, an enzyme synthesized by the bacteria used to make natto, a fermented soybean food.

"Studies have shown that nattokinase has the effect of dissolving blood clots that might otherwise lead to heart attack or stroke.

"Honda Trading has been working with the discoverer of nattokinase, Hiroyuki Sumi, a professor at the Kurashiki University of Science and the Arts, to develop a way to refine nattokinase" so that it has high purity.

The company plans to sell the refined nattokinase in powdered form as a supplement to makers of food and medicine starting this spring.

Two pills a day would provide the same amount of nattokinase as eating a typical 50-gram package of natto. Address: Japan.

1823. Azokpota, P.; Hounhouigan, D.J.; Nago, M.C. 2006. Microbiological and chemical changes during the fermentation of African locust bean (*Parkia biglobosa*) to produce afitin, iru, and sonru, three traditional condiments produced in Benin. *International J. of Food Microbiology* 107(3):304-09. April 1. [36 ref]

Address: Département de Nutrition et Sciences Alimentaires, Faculté des Sciences Agronomiques, Univ. d'Abomey Calavi (UAC), 01 BP 526, Cotonou, Benin.

1824. McNatt, Linda. 2006. These soybeans smell rotten, taste cheesy and sell like crazy. *Virginian Pilot (Norfolk, Virginia)*. May 18.

• **Summary:** "Isle of Wight County—If Americans ever develop a hankering for specialty soybeans that smell slightly rotten and taste like strong cheese, Bill Taliaferro and his brothers at Montague Farms Inc. will be overwhelmed.

"As it is, the family farm operation in Essex County on the Middle Peninsula [of Virginia], has more than it can handle supplying the Japanese market with the specialty

bean called natto. The Japanese eat them for breakfast, in a sandwich spread and in soups.

"The company shipped more than 10,000 tons of the beans last year, so Montague Farms is expanding its operation into Isle of Wight County."

"Researchers at Virginia Tech have developed a new variety of the natto bean that grows particularly well in the mid-Atlantic region, from Maryland to North Carolina. They call it the vanatto." "On the existing market, farmers get \$2.25 a bushel more for the food-grade soybeans than regular soybeans, used for oil and animal food, said Rachel Morris, rural economic development manager in Isle of Wight."

1825. Ikeda, Yukihiro; Iki, M.; Morita, A.; Kajita, E.; Kagamimori, S.; Kagawa, Y.; Yoneshima, H. 2006. Intake of fermented soybeans, natto, is associated with reduced bone loss in postmenopausal women: Japanese Population-Based Osteoporosis (JPOS) Study. *J. of Nutrition* 136(5):1323-28. [35 ref]

• **Summary:** Japanese fermented soybeans (natto), which contain a large amount of menaquinone-7, may help prevent the development of postmenopausal osteoporosis. Bioavailable isoflavones may also contribute to the effect. "The incidence of hip fracture in Japan is lower than in European countries and the United States. The reasons for this difference are unknown," but they are thought to be due to differences in dietary and lifestyle factors. Address: JPOS Study Group, Dep. of Public Health, Kinki Univ. School of Medicine, 377-2 Oono-Higashi, Osaka-Sayama, Osaka, Japan.

1826. Tai, M.W.; Sweet, B.V. 2006. Nattokinase for prevention of thrombosis. *American J. of Health-System Pharmacy* 63(12):1121-23. June 15. \*

Address: Univ. of Michigan College of Pharmacy, Ann Arbor, Michigan.

1827. Pais, E.; Alexy, T.; Holsworth, R.E., Jr.; Meiselman, H.J. 2006. Effects of nattokinase, a pro-fibrinolytic enzyme, on red blood cell aggregation and whole blood viscosity. *Clinical Hemorheology and Microcirculation* 35(1-2):139-42.

• **Summary:** "A fibrinolytic enzyme, termed nattokinase, can be extracted from natto; the enzyme is a subtilisin-like serine protease composed of 275 amino acid residues and has a molecular weight of 27.7 kDa. In vitro and in vivo studies have consistently demonstrated the potent pro-fibrinolytic effect of the enzyme."

"Our in vitro results showed a significant, dose-dependent decrease of RBC aggregation and low-shear viscosity, with these beneficial effects evident at concentrations similar to those achieved in previous in vivo animal trials. Our preliminary data thus indicate positive in vitro hemorheological effects of nattokinase, and suggest

its potential value as a therapeutic agent and the need for additional studies and clinical trials.” Address: Dep. of Physiology and Biophysics, Keck School of Medicine, Univ. of Southern California, Los Angeles, CA 90033.

1828. Kendall, Charles. 2006. Making natto in America (Interview). *SoyaScan Notes*. Aug. 7. Conducted by William Shurtleff of Soyfoods Center.

• **Summary:** Charles first made and sold natto in the fall of 1978. He didn’t make that much in the early years. He no longer has the original labels but he thinks they were rectangular. The next label was circular.

His main business now is making and selling natto—mostly via UPS. Most of his customers are Japanese-Americans, who love his natto and are very loyal. He just stopped making amazake (he almost never drank it himself) and is selling his last cases—largely because he has so much demand for natto. Also amazake and its bottles take a lot of room and a lot of equipment.

Discusses how to make the best quality natto. He has always tried to make the best quality of each food. Of course he starts with organically grown ingredients—soybeans in the case of natto. He does not use any variety of “small seeded soybeans,” but rather uses the cut of small soybeans that result from screening. His natto soybeans are 5.5 to 6.0 mm in size. Some soybean varieties have average seed weights that are smaller than others, yet they still produce many individual soybeans that are too large for natto and must be screened out and used for other purposes. As soon as his natto has finished its basic fermentation, he refrigerates it to 35°F and ships it out. Natto is best 3-4 days after the end of its incubation, when it should be refrigerated. It gets stickier and better. It should never be eaten right away, but it will keep refrigerated for 20-30 days.

He and his wife Yoko (Aveline Kushi’s sister) live in eastern Massachusetts, out in the country. His business is very small; he has the capacity to make 650 containers of natto/day, each weighing 5 ounces. People in the New England area eat much more soybeans during the winter than during the summer—when it is hot, humid, and muggy. He makes natto and mochi, mostly during the cold half of the year, which is when the demand is greatest. He plans to take about 1½ months in the summer to do other things—and to not make foods then. He enjoys making foods, but not all the time. He and his wife are nearing retirement; she is near 70. His two main hobbies are playing golf and gardening.

He and his wife traveled to Mito, Japan, last year and visited a natto maker who still wraps and ferments his natto in straw. He has a machine that does the wrapping and binding. They have to steam the straw first to kill all the undesirable bacteria; the natto bacteria survive the steaming. Humidification is also important. They learned the history of natto there, but nothing new about making natto. Address: Owner, Kendall Food Co., 448 Huntington Rd., Worthington,

Massachusetts 01098-9550. Phone: 413-238-5928.

1829. Kamimura, Yasuko. 2006. Nattô no reshipi 93: nebaneba pawaa de karada bijin [Ninety-three natto recipes: The sticky power way to a beautiful body]. Tokyo: Nitto Shoin Honsha. 127 p. Illust. (color). 21 cm. [Jap]\*

1830. Lee, Joseph. 2006. The sky burns red. Los Angeles, California: Published by the author. 331 p. www.theskyburnsred.com.

• **Summary:** This is a work of fiction. Page 128: “The deal smelled as bad a ‘Nattoh,’ Japanese fermented soybean paste [sic, fermented soybeans] that his friends had made him eat as a dare. He finally ate it, but had to guzzle two bottles of Asahi Super Dry to clear his mouth of the aftertaste.”

Page 330: Japanese words and their translation: “Nattoh: Fermented soy beans.”

On the rear cover is a portrait photo of the author and a brief biography.

Note: This is the earliest English-language document seen (Dec. 2011) that uses the word “nattoh” to refer to natto. Address: International business consultant, Los Angeles, California.

1831. McNatt, Linda. 2006. Japanese demand for natto beans gives Virginia farm all the business it can handle. *Non-GMO Report (The) (Fairfield, Iowa)* 6(8):3-4. Aug.

• **Summary:** From the *Virginian-Pilot*. Natto is fermented whole soybeans that “smell slightly rotten and taste like strong cheese.” Natto soybeans are grown by Bill Taliaferro and his brothers at Montague Farms, Inc. in Essex County, Virginia. The company shipped more than 10,000 tons of the natto beans last year. “Researchers at Virginia Tech have developed a new variety of the natto bean that grows particularly well in the mid-Atlantic region from Maryland to North Carolina. They call it the Vanatto.” Natto soybeans are smaller than typical soybeans and are bright golden in color. Farmers get \$2.25 a bushel more for the food-grade natto beans than for regular soybeans used for oil and animal feed.

1832. Inatsu, Y.; Nakamura, N.; Yuriko, Y.; Fushimi, T.; Watanasiritum, L.; Kawamoto, S. 2006. Characterization of *Bacillus subtilis* strains in Thua nao, a traditional fermented soybean food in northern Thailand. *Letters in Applied Microbiology* 43(3):237-42. Sept.

• **Summary:** The purpose of this research was to determine the diversity of *Bacillus subtilis* strains in Thua nao that produce high concentrations of products useful in food manufacturing and in health-promoting compounds.

“Production of amylase, protease, subtilisin NAT (nattokinase), and gamma-polyglutamic acid (PGA) by the *Bacillus subtilis* strains in Thua nao was measured... Molecular diversity of isolated strains was analysed via randomly amplified polymorphic DNA-PCR fingerprinting.

The strains were divided into 19 types, including a type with the same pattern as a Japanese natto-producing strain.”

Conclusion: Thua nao could be a good source of the desired enzymes. Address: National Food Research Institute, Tsukuba, Japan. inatu@affrc.go.jp.

1833. Lee, T. 2006. Ask the doctor. I would like to find a safer, easier alternative to warfarin, which I have been taking for a couple of years. I have been hearing about nattokinase—can I take it in place of warfarin? *Harvard Health Letter* 17(2):7. Oct. \*

1834. Agrahar-Murungkar, D.; Subbalakshmi, G. 2006. Preparation techniques and nutritive value of fermented foods from the Khasi tribes of Meghalaya. *Ecology of Food and Nutrition* 45:27-38. \*

• **Summary:** *Tungrymbai* or *turungbai* is an indigenous fermented food of Khasi and Garo ethnic groups in Meghalaya. It is similar to kinema. The process for making it is described.

1835. Basu, Debashis; Kulirani, B. Francis; Datta-Ray, B. 2006. Agriculture, food security, nutrition and health in North-East India. New Delhi, India: Mittal Publications. xxvi + 422 p. See p. 299-300. 23 cm.

• **Summary:** Chapter 28 (p. 295-307) is titled “Opportunities for processing and utilization of soybean to increase nutritional security in north-east India, by R.K.P. Singh and K.K. Satapathy. Contents: Introduction. Nutritional profile of soybean. Soybean cultivation in north-east India. Present status of soybean utilization in north-east. Technologies for the soybean utilization as food uses: Soy milk, soy paneer (tofu), full fat soy flour, soy fortified biscuits. By-product utilization of soybean: Okara, soya pulp. Conclusion.

In India, the area under soybean cultivation has increased from about 32,000 ha in 1970-71 to about 6.00 million ha today. During this same time period, soybean production has risen from about 140,000 tonnes to approximately 6,000,000 tonnes, and soybean yield has increased from 438 kg/ha to about 1,000 kg/ha.

Madhya Pradesh is by far India’s leading soybean producing state, accounting for 72-80% of total production, followed by Maharashtra, Rajasthan, and Uttar Pradesh.

In India’s seven north-eastern states, although soybean area and production are very low, soybean yields are higher than the average for all of India—especially in Arunachal Pradesh, Mizoram and Sikkim. This shows that expansion of soybean production has promise in these states.

In the late 1960s and 1970s, soybean was introduced into India primarily as a source of food protein, but this goal has not been met. Today soybean is used primarily as a source of oil for domestic use and protein for export.

In the north-eastern states, however, soybean is used mainly as a pulse crop and as a source of indigenous

fermented foods, such as *tungrymbai* (in Meghalaya; it is consumed mainly in the form of chutney along with rice and vegetable curry) and *kinema* (in Sikkim, eaten with boiled rice). Other soybean food products eaten in north-east India are *hawaijar* (Manipur), *bekang-um* (Mizoram), and *akhoni* [*aakhone*, *akhuni*] (Nagaland), etc.

These soybean foods are all prepared in approximately the same way. Rinse the soybeans then soak overnight in water. Drain, then cook in excess water in an open vessel until each soybean is soft enough to be crushed when pressed between the thumb and one finger. Wrap the warm soybeans in a lamet leaf, place in a bamboo basket, and set the basket above an earthen oven in the kitchen. Leave the soybeans to ferment for 2-3 days until the resulting product shows long, stringy threads when beans are pulled apart, has a sticky texture and the typical strong flavor. To make *tungrymbai* (for example), add green chili, garlic, sesamum / sesame, ginger and salt, then cook in mustard-seed oil for 15-20 minutes.

In May 1984 the Soybean Processing and Utilization Center was established at Central Institute of Agricultural Engineering, at Bhopal. After steady efforts for the past 17 years, the Center has developed equipment and processes for preparing homemade soymilk, soypaneer (tofu), full fat soy flour, soy fortified biscuits, soy dal, etc. (p. 300-01). A detailed discussion each of these products is then given, including its cultural background in Asia, how to make it at home, its nutritional benefits, and ways of adding it to one’s daily meals (p. 301-06). A similar discussion is given for the by-products okara and soya pulp.

On page 307 are 4 interesting references.

1836. Brown, Sabrina L. 2006. The effect of environment on seed composition of tofu and natto soybean cultivars. MSc thesis, University of Missouri-Columbia. 76 p. Internet resource. \*

• **Summary:** “The effect of environment on seed composition of tofu and natto soybean cultivars was measured in Missouri in 2004 and 2005. The environment was altered by varying the planting date and by planting at 7 to 10 locations in four soybean-producing regions in Missouri. The carbohydrates sucrose, raffinose, and stachyose were measured...” Address: Missouri.

1837. Davidson, Alan; Jaine, Tom. 2006. The Oxford companion to food. New York, NY and Oxford, England: Oxford University Press. xxviii + 907 p. Illust. by Soun Vannithone. Index. 29 cm. [1500+\* ref]

• **Summary:** The first edition of this remarkable book (1999) is already a “classic.” “Alan Davidson famously wrote eighty percent of the first edition, which was praised for its wit as well as its wisdom. Tom Jaine, editor of the second edition, worked closely with Jane Davidson and Helen Saberi to ensure that new contributions continue in the same style...”

The text has been updated where necessary” and there are many new entries. The front matter, which is 10 pages longer, begins with “Alan Davidson: A tribute” (p. vii; he died in 2003) followed by a “Preface to the Second edition” by Tom Jaine. Entries in the 1st edition are generally on a different page in this edition. Tofu, for example, formerly on pages 798-99, is now on pages 801-02; however the information is the same. The marvelous illustrations in both editions are by the same artist. The last page of this edition is page 907 compared with page 902 in the 1st edition. Address: World’s End, Chelsea, London, England.

1838. Golbitz, Peter; Jordan, Joe. 2006. Soyfoods: Market and products. In: Mian A. Riaz, ed. 2006. Soy Applications in Food. Boca Raton, Florida, London, New York: CRC Press (Taylor & Francis Group). [x] + 288 p. See p. 1-21.  
 • **Summary:** Contents: History of soyfoods: Growth and development in the Western world, soybean industry blossoms in the United States, soybeans grow around the world. Soybean production and utilization for food: Soyfoods in Asia, soyfoods in Europe, soyfoods in Africa, soyfoods in the United States: Development of the U.S. soyfoods industry, Americanization of soyfoods. Soybean nutritional components: Soy protein, soy oil, carbohydrates and fiber, vitamins and minerals, isoflavones. Soyfoods and protein ingredients: Whole dry soybeans, tofu, soymilk, tempeh, soymilk yogurt, miso, soy sauce, okara, natto, soynuts, meat alternatives, cheese alternatives, nondairy frozen desserts, green vegetable soybeans (edamame), soy sprouts, full-fat soy flour, defatted soy flour, textured soy flour, soy protein concentrate, soy protein isolate. Conclusions.

Tables: (1) World soybean production by major producers. (2) Annual per capita consumption (2001) of soybeans for direct food. (3) U.S. soyfoods market (1996 to 2005).

This chapter suffers from a lack of references, and contains several basic errors concerning the early history of the soybean. Contrary to what Mr. Golbitz says: (1) The Chinese have not considered the soybean a basic source of nutrition for almost 5000 years (see Hymowitz 1970, “On the domestication of the soybean”). For “a little more than 3000 years” would be much more accurate. (2) The first reference to soybeans in Chinese literature does not date back to 2853 B.C. (see Hymowitz 1970, and Hymowitz and Shurtleff 2005, “Debunking soybean myths and legends in the historical and popular literature”). It dates back to about 1100 B.C. (3) Natto was not developed at least 3000 years ago in Japan (the earliest known document that mentions natto dates from 1450 CE—or about 560 years ago). Address: Soyatech, Inc., Bar Harbour, Maine.

1839. Ministry of Agriculture, Forestry and Fisheries [MAFF], Japan. 2006. Tofu, nattô no genjô [The present status of tofu and natto in Japan]. Tokyo: MAFF,

Government of Japan [Jap]\*

• **Summary:** Natto: In 2004 in Japan, total production of natto was about 250,000 metric tons (tonnes), requiring the use of 139,000 tonnes of soybeans. The retail value of this natto was 111.4 billion yen. Address: Japan.

1840. Murakami, Sachiko. 2006. Murakami Sachiko-ryû nebatoru kenkô reshipi [Sachiko Murakami-style sticky-goopy healthy recipes]. Tokyo: Ienohikari Kyokai. 95 p. 21 cm. [Jap]\*

1841. Oishiku tabete kirei ni naru reshipi: daizu no chikara o shinjinasai. Nattô, tenpe, chongutchan [Delicious recipes that make you beautiful: Believe in the power of soybeans: Natto, tempeh, Korean-style natto]. 2006. Tokyo: Gakushû Kenkyûsha. 81 p. Illust. (Color). 26 cm. Series: Gakken mook. [Jap]\*  
 Address: Japan.

1842. Planck, Nina. 2006. Real food: What to eat and why. New York and London: Bloomsbury Publishing. [viii] + 343 p. Index. 22 cm. [30+ ref]

• **Summary:** This book is carefully researched and very well, thoughtfully and fairly written; the author has written for *Time* magazine and comes with very good credentials for this book. Born in 1971 in Buffalo, New York. “She was a speechwriter to the U.S. ambassador to Britain when she opened the first farmers’ market in London on June 6, 1999. Six months later she quit her job to open ten more markets, write *The Farmers’ Market Cookbook*, and host a British television series on local food. In 2003 Nina created the Mount Pleasant Local Food Market in Washington, D.C. In New York City she ran Greenmarket, the largest network of farmers’ markets in the United States. Nina’s new company, Real Food, runs markets for farmers and purveyors of regional and traditional foods” (“About the author,” p. 344).

The author advocates the following: (1) Eat real, traditional foods rather than more modern “industrial foods.” These real foods include plenty of meat, fish, poultry, eggs, and dairy products made from whole raw (unpasteurized) milk from cows grazed outdoors on grass (rather than corn and soybeans, which cows were not designed by eat by nature) without synthetic hormones—plus real, organically grown fruits, vegetables, whole grains and legumes.

(including traditional soy foods), real salt, and dark chocolate  
 (2) Eat real fats—including butter, beef fat, coconut oil, lard, and extra-virgin olive oil, including saturated fats and cholesterol. Avoid industrial fats—such as margarine, polyunsaturated vegetable oils (including soybean, corn, and sunflower oil), and shortening. (3) Go beyond and disregard the cholesterol myth; the evidence supporting it is weak. (4) Stop eating a vegetarian diet, and especially a vegan diet (which no traditional society has ever practiced).

To start with the section on soy foods: In the Chapter 8,



titled "Other real foods," the section on soy foods is titled "Traditional and industrial soy are different" (p. 225-34). Traditional soy foods are those that have a long history in the diet, and are still made in pretty much the way they used to be. Her information on the early history of the soybean and soy foods (p. 225-26) contains many errors, as well as some interesting observations. Some of the earliest soyfoods were fermented (starting with soy nuggets and jiang in China). She lists five health benefits of fermentation. Fermentation (along with cooking) helps to reduce the phytic acid in soybeans. Soy foods do not contain reliable vitamin B-12. The author states several times that soy protein is not complete protein. Most nutritionists for the past 50 years have correctly avoided this "is" vs. "is not" labeling and instead have listed all foods along a continuum from high quality to low quality. By the latest measures of protein quality, soy protein (by itself, without supplementation by cereal grains) has about the same quality as beef, but lower than that of eggs or milk. While noting that about 85% of all soybeans are genetically engineered, she fails to mention that most traditional soyfoods in the USA are made from organic, non-GE soybeans. She discusses the important part that soy plays in the Okinawan diet, where the people have the highest longevity in the world. Yet soy "should be viewed as part of a diverse diet, not as a nutritional silver bullet." We heartily agree. She lists the many traditional soyfoods (p. 231-32), made basically the traditional way, including: Bean sauce (jiang), miso, natto, soy milk (non-industrial), soy sauce, sufu (fermented tofu, incl. Filipino tahuri), tofuyo (fermented tofu from Okinawa), tamari (liquid left after miso is made), tempeh, tofu, and edamame. She recommends that we avoid modern soy protein products made from defatted soybean meal (typically extracted with hexane solvent), including soy protein isolate, "industrial soy milk," soy based infant formula, and soy sauce which uses defatted soybean meal instead of whole soybeans. But what would she do with all the oil left over after using whole soybeans?

Concerning a diet rich in fish, meat, and poultry. She partly ignores the ethical issues involved in killing billions of those animals each year and the environmental issues involved in raising them. These are both huge issues. Several complex issues that she addresses head-on and in a fair, interesting way: (1) Is milk good for humans (p. 39-86).

One of the basic hopes / agendas behind this book is that people will start to leave cities, buy a piece of land (as the author's own family did when she was age 2), grow their own food and raise their own animals for milk, meat, and eggs. There is a steadily growing number of books advocating this traditional way of life.

The Glossary (p. 306-15) contains many good definitions that most people will be able to understand. The bibliography (p. 316-21) is substantial, and there are also endnotes (p. 290-303) but the book would be better if more of its controversial or historical statements cited authoritative

sources. Address: USA.

1843. Sugano, Michihiro. 2006. Nutritional implications of soy. In: Michihiro Sugano, ed. 2006. *Soy in Health and Disease Prevention*. Boca Raton, Florida: Taylor & Francis. [xii] + 313 p. See p. 1-16. [10 ref]

• **Summary:** Contents: Introduction. Structure of soybean. Components of soybean: Proteins, oil, carbohydrates, minerals, vitamins. Composition of soy products. Nutritional aspects of soy products: Protein, peptide, oil, oligosaccharide, vitamins, other components. From "A Meat in the Field" to "A Treasure Box of Functionality."

Tables: (1) Major soybean components and their health effects. Two columns: Components and functions. (2) Nutrient contents of dried soybean (incl. minerals and vitamins). (3) Nutrient contents of soybean products (gm per 100 gm): Kinako (parched soybean flour, full-fat). Tofu (bean curd). Abura-age (fried bean curd). Kori-tofu (frozen bean curd). Natto (fermented soybean). Okara (Tofu refuse). Tonyu (soymilk). Yuba (Soymilk skin). Tempe. Miso (bean paste). Shoyu (soy sauce). Soy protein isolate. (4) Mineral contents of soybean products (sodium, potassium, calcium, magnesium, phosphorus, iron, zinc, copper, manganese; same products as in Table 3). (5) Vitamin contents of soybean products (retinol, carotene, D, E, K, B-1, B-2, niacin, B-6, B-12, folic, pantothenic, C; same products as in Table 3). (6) Amino acid and protein composition of Japanese soybean products. (7) Proposed patterns for essential amino acid requirements and composition of soybean proteins (soy protein concentrates and isolates). (8) Fatty acid composition of soybean oils (% of total fatty acids) (Products: Refined soybean oil, genetically modified oils, low linolenic, high oleic, low palmitic, low saturated fatty acid, high palmitic, high stearic).

Figures: (1) Pie chart of intake of soybean and its products in Japan (gm per day of tofu {38.2 gm}, fried tofu {7.9 gm}, natto {6.9 gm}, whole soybeans {2.0 gm}, other {2.3 gm}; Total 57.3 gm per day). (2) Bar chart: Amino acid score of dietary proteins in humans (casein 1.0, egg white 1.0, soy protein concentrate 9.9, soy protein isolate 9.5, beef 9.5). (3) Graph and bar chart: Soybean protein lowers liver delta-6 desaturase activity and liver phospholipid delta-6 desaturation index in rats—relative to casein. Address: Director, Fuji Foundation for Protein Research, Japan; Professor Emeritus Kyushu University and President, Prefectural Univ. of Kumamoto, Japan.

1844. Sumi, Hiroyuki; Yatagai, Chieko. 2006. Fermented soybean components and disease prevention. In: Michihiro Sugano, ed. 2006. *Soy in Health and Disease Prevention*. Boca Raton, Florida: Taylor & Francis. [xii] + 313 p. See p. 251-278. [76 ref]

• **Summary:** Contents: Introduction. Natto: Antibacterial activity of natto and natto bacillus, fibrinolytic enzyme

substances contained in natto, depressor effects, carcinostatic effects, and dissipation of the effects of alcoholic drinks, preventive effects for osteoporosis. Tempeh: Strong antibacterial activity and effectiveness against intestinal disorders, antioxidant, antiallergic, and beauty care effects, starters for tempeh and high nutritional value. Shoyu (soy sauce): Antibacterial, antioxidation, and depressor effect, antitumor effects. Miso (soybean paste): Effectiveness of soybean paste for cancer prevention, depressor effects, antioxidation and antiradioactivity effects. Tofuyo.

Tables: (1) Dipicolinic acid in natto and *Bacillus subtilis* natto. (2) Fibrinolytic activity in human plasma after the intake of natto. (3) Expired gas and intestinal gas after intake of tempeh. (4) Isoflavone content in tempeh. (5) Antioxidation activity of the aromatic components of shoyu (soy sauce). (6) Functional effects of melanoidine contained in shoyu (soy sauce) and miso (soybean paste).

Figures: (1) Graph of the effects on *O-157* as a result of the addition of natto bacillus. (2) Graph of the effects on *H. pylori* (Sydney strain) resulting from the addition of natto extracts. (3) Photo of fibrinolytic activity of natto. A piece of natto commonly sold on the market was placed in a petri dish with artificial thrombus. (4) The molecular structure of nattokinase. (5) Photo of fibrinolytic activity of nattokinase. (6) 3 graphs of changes in the fibrinolytic parameters in the blood after oral administration of nattokinase to human volunteers. (7) Graph of the effects of natto extracts on blood pressure. (8) Graph of the inhibitor activity of platelet aggregation. (9) 2 graphs of the concentration of vitamin K<sub>2</sub> in human blood after the intake of natto. (10) Bar chart of change in the concentration of menaquinone-7 in plasma after ingestion of natto. (11) Graph of the effects of the tempeh bacteria on aflatoxin-producing bacteria. (12) Diagrams of the aromatic components of shoyu (soy sauce). (13) Bar chart of the effects of the concentration of nitrous acid on the antitumor activity of shoyu (soy sauce). (14) Chart of the carcinogenesis inhibitor effects of HEMF against proventriculus tumors induced by benzo[a]pyrene. (15) Bar chart of standardized mortality from stomach cancer relative to the level of frequency of eating miso soup. (16) Graph of changes in blood pressure by oral administration of miso (soybean paste) extracts. (17) Graph of reaction between coloring degree of miso and its antioxidative activity. Address: Dep. of Physiological Chemistry, Kurashiki Univ. of Science and the Arts, Kurashiki, Japan.

1845. Wang, Yi-Chieh; Yu, R.C.; Chou, C.C. 2006. Antioxidative activities of soymilk fermented with lactic acid bacteria and bifidobacteria. *Food Microbiology* 23:128-35. [34 ref]

• **Summary:** Probiotics can serve as antioxidants. "Previous research has demonstrated that the antioxidative activity fermented soyfoods such as miso, natto, and tempeh, was remarkably stronger" than that of unfermented steamed

soybeans,

To develop a probiotic dietary adjunct / supplement, soymilk was fermented with two different lactic acid bacteria: (1) *Lactobacillus acidophilus* CCRC 14079, or (2) *Streptococcus thermophilus* CCRC 14085. And with two bifidobacteria: (3) *Bifidobacterium infantis* CCRC 14633, or *Bifidobacterium longum* B6—individually and in conjunction (all together). Several antioxidative activities were investigated: The inhibition of ascorbate autoxidation. The scavenging effect of superoxide anion radicals and hydrogen peroxide, and the reducing activity exerted by different varieties of fermented soymilk. In addition, the effects of freeze-drying and spray drying were also investigated.

"In general, antioxidative activity in soymilk fermented with lactic acid bacteria and bifidobacteria simultaneously is significantly higher ( $P < 0.05$ ) than that fermented with either individually. Moreover, antioxidative activity increases as the fermentation period is extended.

Freeze drying causes much less reduction in antioxidative activity than does spray drying. Address: Graduate Inst. of Food Science & Technology, National Taiwan Univ. 59, lane 144, Kelung Road, Section 4, Taipei, Taiwan.

1846. Chow, Cheryl; Chow, James. 2007. Hypoglycemia for dummies. New York, NY: John Wiley & Sons. 288 p.

• **Summary:** Soyfoods are a good source of protein in the diets of those suffering from hypoglycemia (low blood sugar). Soy is mentioned on page 37, 38, 41, 91 (MSG is also called hydrolyzed protein, soy extract, meat tenderizer, Accent, Ajinomoto), 104, 106 (milk substitutes, including soy milk, should not contain added sweetener), 107 (such as tofu, tempeh and natto are good sources of protein, but intake should be limited to 2-3 servings of whole soy foods a day), 196, (soy milk), 250 (soy products make good meat substitutes), and 258.

Concerning natto (p. 250): "These sticky, fermented [soy] beans are a great vegetarian source of protein... In Japan natto is often eaten over rice for breakfast." However natto has a strong odor which takes some time to get used to.

1847. *Heart Advisor (The Cleveland Clinic)*. 2007. Ask the doctor. I have read good news about nattokinase and would like to use it to keep my blood thin. Is it a good substitute for aspirin? 10(4):8. April. \*

1848. Sullivan, Cheryl L.; Nash, Marilyn. 2007. Soy on the menu: Recipes for foodservice. Champaign-Urbana, Illinois: Illinois Center for Soy Foods. 52 p. Illust. No index. 26 cm. Series: Soy in the American Kitchen.

• **Summary:** This book has a creative format: (1) An outer color cover folds over the white spiral binding. (2) The pages are spiral bound across the top. (3) The bottom unfolds like a gusset so the book stands up by itself on a table with the

pages angled slightly back on a table. (4) A CD-ROM comes with the book. Remarkably, the whole package sells for only \$3.00!

Contents: Bringing soy foods to the American table: Soy in foodservice, why choose soy?, soy foods, vegetarian and vegan recipes [in this book], recipe information, nutrient information, acknowledgements. Recipes: Appetizers. Breakfast. Breads. Salads. Soups. Side dishes. Main dishes. Desserts.

The recipes in this book use: Soy flour, soymilk, tofu, textured vegetable protein / TVP [texture soy flour], edamame, black soybeans, soy analogs [meat and dairy analogs].

Sidebars include: Biodiesel (p. 10). Research shows kids like soy in school lunches (p. 11). Uncommon soy foods: Tempeh, miso, okara, natto. Are you soy savvy?: Why is soy flour added to baked goods? (p. 14). U.S. soybean production, yield, exports, and domestic usage (1979 vs. 2004) (p. 16). Industrial uses of soybeans: Soy candles, ink, biodiesel, soy cleaners, waterproofing sealants, soy silk (fabric). Are you soy savvy? Edamame (p. 19). INTSOY (p. 22). NSRL (p. 24). What is the soybean checkoff? (p. 27). WISHH initiative for soy in human health (p. 29, 30). Illinois Soybean Association (p. 34). What is okara? Why should you shake up a carton of soymilk? (p. 39). Make your own tofu (p. 47). Address: 1. M.A., R.D., Research Dietitian; 2. Ph.D., Project coordinator. Both: 170 National Soybean Research Center, 1101 W. Peabody Dr., Urbana, Illinois 61801. Phone: (217) 244-1706 or [www.soyfoodsillinois.uiuc.edu](http://www.soyfoodsillinois.uiuc.edu).

1849. Monden, Eiji. 2007. What is natto? Natto to save the earth! Presented Sept. 16 at 2007 Midwest Specialty Grains Conference & Trade Show. 29 p. Held Sept. 16-18 in Fargo, North Dakota.

• **Summary:** A PowerPoint presentation with 29 slides containing color photos and graphics. (2) Table of contents. (3) About Federation of Japan Natto Manufacturers' Cooperative Society. Phone: 03-3832-0709. President: Takashi Sasanuma. Established: April 1954. Members: 251 natto manufacturers. Objective: To work cooperatively among members to conduct natto promotion activities and improve natto makers' economic status. Qualifications: Must be a natto manufacturer that owns an office in Japan. History: 1939–Prefectural natto cooperatives were organized, 1941–Established Japan Natto Industry Cooperative Association. 1953 [after World War II]–Re-organized to Federation of Japan Natto Manufacturers' Cooperative Society.

(4-5) Activities: National natto contest. Natto symposium. Natto queen ceremony. (6) What is natto? With photos of soybeans, container of natto, natto mixed with rice being lifted out of a bowl with chopsticks. (7) Natto making: The 3-day process. (8-10) Health benefits of natto. Medical uses: Reduces likelihood of blood clotting. Contains large amounts of vitamin K. Contains large amounts of enzyme

called nattokinase which may also reduce blood clotting. (11-12) Types of Natto. Sticky natto and Dried Natto. Whole soybean natto, hikiwari natto (from cracked soybeans) and goto natto (hikiwari natto and malted rice [rice koji]) are all types of sticky natto, while Tera Natto (Temple Natto) is the only dried natto. It is black and salty, and was introduced to Japan by priests who studied in China. Photos show Itohiki Natto (Sticky natto), Goto Natto, Tera Natto, and Cracked Bean Natto. (13) How to eat Natto. Photos show a package of natto, the package open to show its contents, with the natto, a packet of sauce, and a packet of mustard, and the natto served in a bowl on top of rice. (14) History of Natto. *Bacillus natto* are naturally found on straw; in the Taisho period (1912-1926), researchers found a way to cultivate the bacillus without straw. This made the natto easier to produce and more reliable. (15-16) Natto Market. Graph shows Natto Consumption per household per year and volume of natto market. 130,000 MT [metric tons] of soybean are used annually to produce 4.7 billion packages (50 g natto/package) of natto. (17) Reasons for purchasing Natto. (18) How did you learn the health benefits? Graph shows how people learned about the benefits of natto. (19-21) Natto Variety. Graph shows soybean use for Natto by country of origin, 2007 Food soybean use by usage. In 2007, 956,000 MT of soybeans were used for food; 135,000 of which went to produce Natto. Graph shows price trends for a bushel of soybeans. (23) World Average Life Span Rankings. Table shows that Japan ranks first, with an age of 82 years. The United States is 26th at age 78. (24) Future Market: Further research on new natto health benefits, new menu development of natto, further natto market expansion domestically and globally. (25) Expectations of the U.S. IP [identity preserved] soy industry: To strengthen more direct communication for new variety development with natto manufacturers at an early stage, to continue growing food soybeans, continuing demands and market potential for U.S. Non-GMO soybeans exist in Japan, the possibility of launching a natto market similar to the soysauce market in the United States. Address: Federation of Japan Natto Manufacturers' Cooperative Society (Zenkoku Natto Kyodo Kumiai Rengokai), 4th Floor, Natto Kaikan 2-7-10 Moto-Asakusa, Taito-ku, Tokyo 111-0441 JAPAN.

1850. Dorff, Erik. 2007. The soybean, agriculture's jack-of-all-trades, is gaining ground across Canada (Web article). <http://www.statcan.gc.ca/pub/96-325-x/2007000/article/10369-eng.pdf>. 14 p. Oct. 26. Printed 28 Jan. 2010. [7 ref]

• **Summary:** An outstanding overview and description of the current status of soybeans in Canada.

Contents: Introduction. Development of the soybean sector in Canada. Growth in soybean area across the country. The soybean—an international super-crop. Soybean dollars make sense to farmers. One crop, many uses. Food for

human consumption. Animal feed. Industrial products. Soybean not a “has-bean” crop in Canada. The gift of the bean (a brief early history of the soybean in the USA and Canada).

Figures: (1) Gains in soybean area reflect crop development efforts (1951-2006; 000 hectares). (2) One crop many uses. Diagram showing uses as: Food for human consumption, animal feed, industrial products. (3) Bred in Canada: soybeans of prominence. AC Proteus, Toki (for tofu), Nattawa (for natto), Maple Arrow (expanded soybean range out of southern Ontario), Maple Presto (the fastest maturing soybean). (4) Traditional soy foods: a brief guide (with a description of each). Edamame, miso, natto, soy sauce, soy milk, tempeh, tofu.

Tables: (1) Census of agriculture tracks growth in soybean area. Gives the area planted in Canada, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, and Alberta in the census years of 1976, 1981, 1986, 1991, 1996, 2001, and 2006. Soybeans were planted in each of these provinces in the three most recent census years. (2) Top 10 soybean producing nations (Average 2000 to 2005): After the USA, Brazil, and Argentina, China is 4th, India 5th, Paraguay 6th, Canada 7th, Bolivia 8th, Indonesia 9th, and Italy 10th. (3) Average soybean composition. Columns: Characteristic, oil, feed and meal beans, soy milk / tofu soybeans. For the latter: 100 seeds should weigh more than 20 gm. Colour very light with clear hilum, oil content 17-19%, protein content 44-47%, soluble sugar content 11-13%, insoluble sugar content 21-25%, minerals 5%. (4) Nutritional comparisons: Tofu and soy milk with ground beef and cow’s milk.

Maps: (1) Soybeans in Canada (3 maps on one page). Map A shows that quite a bit of Quebec’s soybean acreage lies south of the Saint Lawrence River, in the region named “Southern Quebec” (which includes the Eastern Townships at its southernmost area—its south-western end).

“Until the mid-1970s, soybeans were restricted by climate primarily to southern Ontario. Intensive breeding programs have since opened up more widespread growing possibilities across Canada for this incredibly versatile crop: The 1.2 million hectares of soybeans reported on the Census of Agriculture in 2006 marked a near eightfold increase in area since 1976, the year the ground-breaking varieties that perform well in Canada’s shorter growing season were introduced” (p. 1).

“For years, soybeans were being grown in Canada but it wasn’t until the Second World War that Statistics Canada began to collect data showing the significance of the soybean crop, with 4,400 hectares being reported in 1941. In fact, one year later the area had jumped nearly fourfold, to 17,000 hectares. In 1943 a program aimed at actively breeding soybeans suitable for southern Ontario was initiated.

“During the Second World War, North American manufacturers used oil from soybeans not only as a food

but also to produce a wide number of industrial products including glycerine for the manufacture of nitroglycerine used for explosives and ammunition.

“By 1951, 62,967 hectares had been planted with soybeans (Figure 1), but they were still mostly confined to southern Ontario, the region with the longest and warmest growing season in Canada” (p. 2).

“It wasn’t until varieties with earlier maturity and improved tolerance of cooler climates were successfully developed—the ‘Maple’ series of soybean cultivars—that significant soybean production was pushed beyond southern Ontario. The 1976 release of the Maple Arrow variety in particular is credited with expanding the range of soybean production into eastern Ontario (Table 1).”

The “growth between 2001 and 2006 was particularly notable in the Prairie provinces, with Manitoba’s soybean area increasing sevenfold to over 141,869 hectares and its more western neighbours, Saskatchewan and Alberta, beginning to actively pursue soybean production. These gains in area were the payoff from research aimed at finding and breeding soybean varieties suited to the Prairies as well as from crop promotion and market development” (p. 5).

“In the 2006 calendar year, farm cash receipts from soybeans amounted to \$680 million in Canada, making it the fifth most valuable field crop, trailing canola (\$2.5 billion), wheat (\$1.8 billion excluding durum), potatoes (\$899 million) and corn (\$753 million). In Ontario, where it was also the most planted crop, it was the top crop in terms of farm cash receipts, at \$547 million, eclipsing the receipts from corn (\$449 million) and wheat (\$275 million)” (p. 6).

“International trade contributed to the value of soybean receipts. Preliminary figures place soybean exports at over 40% (1.5 million tonnes) of the soybeans grown in Canada in the 2006 crop year (3.5 million tonnes).

“Of the four top buyers in 2006, Japan led the list, importing \$138 million in Canadian soybeans, followed by Malaysia (\$52 million), the Netherlands (\$49 million) and Iran (\$43 million). At the same time, Canada imported about 302,000 tonnes of soybeans valued at approximately \$81 million, 99% of which came from the United States” (p. 7). Address: Statistics Canada.

1851. Li, X.; Wang, X.; Xiong, S.; Zhang, J.; Cai, L.; Yang, Y. 2007. Expression and purification of recombinant nattokinase in *Spodoptera frugiperda* cells. *Biotechnology Letters (Kew, England)* 29(10):1459-64. Oct.

• **Summary:** The Fall Armyworm (*Spodoptera frugiperda*) is part of the order of Lepidoptera (butterflies and moths) and is the caterpillar life stage of a moth. It is regarded as a pest and can wreak havoc with crops if left to multiply.

*Spodoptera frugiperda* cells (Sf9 and Sf21 cell lines) are commonly used in biomedical research for the purpose of recombinant protein expression using insect-specific viruses.

This article states: “A recombinant baculovirus, rv-egfp-

NK, containing a reporter gene encoding the enhanced green fluorescent protein (EGFP), was used to express nattokinase (NK), a fibrinolytic enzyme, in *Spodoptera frugiperda* (SF-9) cells." Address: College of Life Sciences, Hubei University, Wuhan, Hubei, 430062, China.

1852. Meerak, Jomkhwan; Iida, H.; Watanabe, Y.; Miyashita, M.; Sato, H.; Nakagawa, Y.; Tahara, Y. 2007. Phylogeny of gamma-polyglutamic acid producing *Bacillus* strains isolated from fermented soybean foods manufactured in Asian countries. *J. of General and Applied Microbiology (Tokyo)* 53(6):315-23. Dec. [23 ref]

• **Summary:** Natto and closely related fermented soyfoods are made and consumed in many Asian countries. In this study, 34 *Bacillus* strains capable of producing gamma-polyglutamic acid (PGA) were isolated from natto and its relatives in mountainous areas of South Asia and Southeast Asia and from soils in Japan. This phylogenetic analysis shows the similarity among strains of *Bacillus subtilis* isolated from various sticky fermented soyfoods of Asia. This suggests that *B. subtilis* strains responsible for the fermentation of sticky Asian soyfoods might have originated from the same stock.

The foods examined include: Kinema from Darjeeling (West Bengal, India) and Dhankuta (Nepal). Thua-nao from Maehongsorn and Chiangmai, Thailand. Tan-douchi from Ruili, Yunnan province (near the border with Myanmar). Chungkuk jang from Taegu, Korea. Also, soil was examined from Hokkaido, Iwate, Nagano, and Yamagata, Japan. Address: 1-3, 7. Dep. of Applied Biological Chemistry, Faculty of Agriculture, Shizuoka Univ., Shizuoka 422-8529, Japan.

1853. Tamang, Jyoti Prakash. 2007. Fermented foods for human life. In: Ashok K. Chauhan, A. Varma, Harsha Kharkwal, eds. 2007. *Microbes for Human Life*. New Delhi, India: I.K. International Publishing House. And: Tunbridge Wells, Kent, England: Anshan. xvi + 678 p. See p. 73-87. 25 cm. [77 ref. Eng]

• **Summary:** Contents: Abstract. Key-words. Introduction. 1. Enrichment of diet. 2. Bio-preservation. 3. Bio-enrichment of nutritional value. 4. Degradation of undesirable compounds. 5. Improvement of lactose metabolism (for people suffering from lactose intolerance or malabsorption). 6. Probiotic function. 7. Production of enzymes (which break down / hydrolyze complex molecules, making them easier to digest). 8. Antimicrobial properties (help preserve foods and destroy pathogens). 9. Anticarcinogenic properties. 10. Reduction in serum cholesterol (from consumption of fermented milks). 11. Therapeutic values (koumiss, kvass). Conclusion.

This article is primarily about the benefits of fermentation and fermented foods, as well as about functional foods and probiotics.

The following fermented soyfoods are mentioned:

kinema, natto, tempe [tempeh].

Note: Another list of the primary benefits of fermented soyfoods from a PowerPoint presentation by Jyoti Tamang in 2010 is as follows: 1. Improvement of flavour and aroma. 2. Bio-enrichment of nutritional value (vitamins). 3. Improved digestibility. 4. Degradation of anti-nutritive factors. 5. Improvement in bio-availability of minerals. 6. Production of enzymes. 7. Low-fat and low-cholesterol food. 8. Anti-allergy. 9. Antioxidant activities (anticarcinogenic properties). 10. Therapeutic values: prevention of osteoporosis, heart disease. 11. Low-cost high plant protein food. Address: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1854. Tamang, Jyoti Prakash. 2007. History of scientific developments in Darjeeling Hills. In: P.J. Victor, ed. 2007. *Discursive Hills: Studies in History, Polity and Economy*. Darjeeling, India: St. Joseph's College. viii + 252 p. See p. 237-41. Illust. 24 cm. Papers presented at the National Seminar on the History and Development of the Hill Stations in India, held at Darjeeling, 2-3 Sept. 2005. [Eng]\* Address: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1855. Hui, Yiu H.; Chandan, Ramesh C.; Clark, Stephanie; et al. ed. 2007. *Handbook of food products manufacturing: health, meat, milk, poultry, seafood, and vegetables*. 2 vols. Hoboken, New Jersey: John Wiley & Sons, Inc. Illust. (color). 22 cm.

• **Summary:** In Chapter 46, "Bioactive peptides from food proteins," we read (p. 15): "... ACE-inhibitory activity has been isolated from soybeans fermented with *Bacillus subtilis* and *chunggugjang* [Korean natto] fermented with *Bacillus subtilis*." In both studies, the optimal conditions for production were 60 hours fermentation at 40°C (Cho et al. 2000). Address: Senior Scientist, Science Technology System, West Sacramento, California.

1856. Losso, Jack N.; Shahidi, Fereidoon; Bagchi, Debasis. 2007. *Anti-angiogenic functional and medicinal foods*. Boca Raton, Florida: CRC Press. 715 p. See p. 131. Illust. 24 cm. [30+ ref]\*

• **Summary:** Section 6.2.2 "Fermented soy foods (Doenjang, chonggukjang, and ganjang)" has the following contents: 1. General characteristics of doenjang, chonggukjang, and ganjang. 2. Health promoting effects of doenjang, chonggukjang, and ganjang.

Doenjang is Korean soy paste [somewhat like Korean miso]; it is made from meju (a fermented mass of cooked soybeans [soybean koji]) and takes several months to ferment. In traditional meju the main microorganisms are *Aspergillus oryzae*, *Aspergillus sojae* and *Bacillus subtilis*. "In the past, doenjang was obtained by separating the soy sauce (ganjang) after fermentation of meju in brine for

several months. However, commercial doenjang is now produced as a sole product without separation of ganjang, and other cereals are often added to soybeans as a substrate [as is also the case for Japanese miso]. Modern meju is prepared on an industrial scale by inoculating” the substrate with *Aspergillus oryzae* “and *Bacillus* rather than depending on natural contaminant flora.”

Chonggukjang is another type of fermented soybean paste; in Korea it is typically consumed as the basis of a soup and takes only a few days to ferment. The fermented soybeans are typically mixed with salt, garlic, ginger, and red chili pepper before being used as a soup base. Chonggukjang was first mentioned in the *Sanlim Gyongje*, by Hong Man-Sun, an agricultural encyclopedia published in 1715. Note: It could be called Korean natto.

Ganjang is Korean soy sauce. Traditionally it was made by separation of the liquid from doenjang [From Google Books Preview].

1857. Mao, A.A.; Odyuo, N. 2007. Traditional fermented foods of the Naga tribes of Northeastern India. *Indian J. of Traditional Knowledge (New Delhi)* 6(1):37-41. [21 ref]\*  
**• Summary:** Aakhone, also called axone, is an indigenous sticky fermented soyfood of the Sema Naga, in the Indian northeast state of Nagaland. It is similar to kinema.

Note: This is the earliest document seen (Jan. 2012) that uses the word “axone” to refer to a fermented soyfood from Nagaland and a close relative of Japanese natto.

1858. Robinson, Martin; Bartlett, Ray; Whyte, Rob. 2007. Korea. 7th ed. Footscray, Victoria, Australia; London: Lonely Planet. 440 p. Illust. (some color). Maps (some color). Index. 20 cm. [30+ ref]

**• Summary:** This is a travel guidebook to Korea, including North Korea (p. 344+). Many maps. Page 23: The Korean word *doenjang* means “soybean paste;” it is used as a base for soups.

Page 62: In Korea, chili pepper usually takes the form of *gochujang* (red pepper paste). It is a popular topping for Bibampap

Page 71-72: Soups and stews—haejangguk = bean sprout soup. doenjang jjigae = soybean paste stew. dubu jjigae = tofu stew. sundubu jjigae = spicy uncurdled tofu stew [sic, tofu / soymilk curds in spicy stew]. sundubu = uncurdled tofu [sic, soymilk curds]

Page 177: “Tofu lovers and vegetarians will want to head for ‘Tofu Village,’ a cluster of restaurants that feature tofu.”

Page 180: The Korean word for soymilk curds (or unset tofu) is *sundubu*.

Page 181: In Gang-Won-Do a restaurant named Yujeong Cheonggukjang serves a superb spicy soup that resembles miso soup but is actually made with Korean natto (*cheonggukjang*).

Note: This is the earliest English-language document seen (Jan. 2012) that uses the word “cheonggukjang” to refer to Korean-style natto.

Page 222. The Korean word for tofu is *dubu*.

The interesting section on North Korea starts on page 344.

Page 389: In the box titled “Unusual festivals” [in North Korea]—Chodang’s Uncurdled Tofu Festival; exciting only for vegetarians.

Also: Tofu (*dubu*) is mentioned on pages 63-66, 71-72, 90, 125, 151, 170, 174, 175, 177, 180, 185, 192, 222, 283, 288, 321, 326, 389.

1859. Tamang, Jyoti Pradash; Thapa, N.; Rai, B.; Thapa, S.; Yonzan, H.; Dewan, S.; Tamang, B.; Sharma, R.M.; Rai, A.K.; Chettri, R.; Mukhopadhyay, B.; Pal, B. 2007. Food consumption in Sikkim with special reference to traditional fermented foods and beverages: A micro-level survey. *J. of Hill Research (Sikkim)* 20(1S):1-37. Supplement issue. [22 ref]

**• Summary:** Table A, “Ethnic fermented foods of Sikkim” (p. 5) includes (as its first entry): Product: Kinema. Substrate: Soybean. Nature and use: Sticky soybeans; curry. Major consumer: non-Brahman Nepalis. Reference: Tamang (2001).

Consumption patterns of fermented foods (p. 11): In Sikkim, food consumption patterns show that 11.7% of rural people are vegetarians and 88.3% are non-vegetarians. Rice is the most staple food in the diet of Sikkim, with average per capita consumption of 2.6 kg/week—compared with 2.3 gm/week of kinema. Kinema, which is a good source of protein, is typically consumed 2-4 times per week. About 12.6% of the total foods consumed in Sikkim are fermented.

Table 8, “Distribution of households indicating source of acquiring fermented products by ethnic group” (p. 19) states for kinema–Nepali: 57.5% use homemade kinema, 31.3% use kinema purchased at the market, and 11.3% use both. Bhutia: 14.7% use homemade kinema, 67.7% use kinema purchased at the market, and 17.7% use both. Lepcha: 77.5% use homemade kinema, 17.5% use kinema purchased at the market, and 5.0% use both.

Table 9, “Average annual production (in grams) of fermented foods per household per year by ethnic groups.” N = number of households reporting. SD = standard deviation. Kinema–Nepali: 7,955.6 gm. N = 55. SD = 16,073.5. Bhutia: 3,081.8 gm. N = 11. SD = 3,862.3. Lepcha: 3,751.5 gm. N = 33. SD = 6,362.4. Total: 6,012.7 gm. N = 99. SD = 12,724.2.

Table 10. “Average annual production (in grams) of fermented foods per household per year by districts.” In descending order: East 16,095. South: 4,498.5. North: 4,492.3. West 1,755.6.

Table 11. “Per capita consumption (gm/day) of fermented foods per day by ethnic groups” (Mean ± SD): Nepali 3.4 gm ± 6.9 gm. N = 80. Bhutia 1.1 gm ± 1.7 gm. N

= 34. Lepcha 1.4 gm ± 2.4 gm. N = 40. Total 2.3 gm ± 5.3 gm. N = 154.

Table 12. “Per capita consumption (gm/day) of fermented foods per day by districts.” Address: 1-10. Food Microbiology Lab., Dep. of Botany, Sikkim Government College, Gangtok 737102, Sikkim, India; 11-12. Biological Anthropology Unit, Indian Statistical Inst., 203, B.T. Road, Kolkata 700108, West Bengal, India.

1860. Tandon, Pramod; Abrol, Y.P.; Kumaria, Suman. 2007. Biodiversity and its significance. New Delhi, India: I.K. International Pub. House. xii + 370 p. See p. 77. Illust. Map. 25 cm. \*

• **Summary:** Page 77: “Soybean (*Glycine max*): Soybean is widely cultivated in Sikkim, Nagaland, Meghalaya and Arunachal Pradesh. Considerable genetic variation exists in the North-Eastern materials. Very small sized soybean occurs in Nagaland and Mizoram.”

1861. Shurtleff, William; Aoyagi, Akiko. 2008. Le livre du tofu: La source de protéines de l’avenir—dès maintenant! [The book of tofu: Protein source of the future—now! Translated from the English by Nathalie Tremblay]. Varennes, Quebec, Canada: Éditions AdA Inc. 430 p. Illust. by Akiko Aoyagi. Index. Feb. 28 cm. [53 ref. Fre]

• **Summary:** Contents: Preface. Acknowledgements. Part I. Tofu: Food for mankind. 1. Protein East and West. 2. Tofu as a food. 3. Getting started. Our favorite tofu recipes (lists about 80 recipe names for each of the different types of tofu, plus soymilk, yuba, whole soybeans, gô, okara, and curds; very favorites that are also quick and easy to prepare are preceded by an asterisk).

Part II. Cooking with tofu: Recipes from East and West (500 recipes). 4. Soybeans: History, cooking with whole dry soybeans, roasted soybeans (*iri-mame*), fresh green soybeans (*edamame*), kinako (roasted full-fat soy flour), soybean sprouts (*daizu no moyashi*), natto (sticky fermented whole soybeans, with “gossamer threads”), tempeh (fermented soybean cakes), Hamanatto and Daitokuji natto (raisin-like natto), modern western soybean foods (natural soy flour [full-fat], soy granules, defatted soy flour and grits, soy protein concentrates, soy protein isolates, spun protein fibers, textured vegetable protein (TVP), soy oil products). 5. Gô (a thick white puree of well-soaked uncooked soybeans). 6. Okara or Unohana. 7. Curds and whey. 8. Tofu (includes history, and preparatory techniques: Parboiling, draining, pressing {towel and fridge method, slanting press method, sliced tofu method}, squeezing, scrambling, reshaping, crumbling, grinding).

9. Deep-fried tofu: Thick agé or nama agé, ganmo or ganmodoki (incl. *hiryozu / hirosu*), agé or aburagé (incl. “Smoked tofu,” p. 197). 10. Soymilk. 11. Kinugoshi (“*Kinu* means ‘silk’; *kosu* means ‘to strain’; well named, kinugoshi tofu has a texture so smooth that it seems to have been

strained through silk”). 12. Grilled tofu. 13. Frozen and dried-frozen tofu. 14. Yuba (incl. many meat alternatives such as Yuba mock broiled eels, Buddha’s chicken, Buddha’s ham, sausage). 15. Tofu and yuba in China, Taiwan, and Korea (incl. Savory tofu {*wu-hsiang kan*}; see p. 258 for illustrations of many meat alternatives, incl. Buddha’s fish, chicken, drumsticks, and duck, plus vegetarian liver and tripe, molded pig’s head, and molded ham). 16. Special tofu.

Part III—Japanese farmhouse tofu: Making tofu for more and more people. 17. The quest. 18. Making community tofu. 19. The traditional craftsman. 20. Making tofu in the traditional way. Appendices: A. Tofu restaurants in Japan (many are vegetarian). B. Tofu shops in the West (Directory of 43 shops in the USA, 3 in Europe {Germany, Austria, Belgium, Denmark, Finland, France, Ireland, Italy, Netherlands, Portugal, Spain, Switzerland, UK, Wales}, and 3 in Latin America {Brazil, Colombia, El Salvador, Guatemala, Mexico}). C. People and institutions connected with tofu. D. Table of equivalents. Bibliography. Glossary. Index. About the authors (autobiographical sketches; a photo shows Shurtleff and Aoyagi, and gives their address as New-Age Foods Study Center, 278-28 Higashi Oizumi, Nerimaku, Tokyo, Japan 177). Sending tofu in the four directions.

Pudding recipes include: Rice pudding with gô and apple (p. 76, incl. 2 cups soymilk). Tofu chawan-mushi (p. 147; Steamed egg-vegetable custard with tofu). Tofu fruit whips (p. 148). Tofu rice pudding (p. 150, incl. 1 cup soymilk). Tofu custard pudding (p. 152). Soymilk custard pudding (p. 208). Brown rice pudding (p. 208, with 2 cups soymilk). Soymilk chawan-mushi (p. 209). Chawan-mushi with yuba (p. 249).

Dessert recipes include: Tofu whipped cream or yogurt (p. 148; resembles a pudding or parfait). Tofu ice cream (p. 149, with chilled tofu, honey, vanilla extract and salt). Banana-tofu milkshake (p. 149). Tofu cream cheese dessert balls (p. 149). Tofu icing (for cake, p. 149). Tofu cheesecake (p. 150). Tofu-pineapple sherbet (p. 151). Also: Soymilk yogurt (cultured, p. 205). Healthy banana milkshake (p. 206). On p. 160 is a recipe for “Mock tuna salad with deep fried tofu.” Address: Soyinfo Center, P.O. Box 234, Lafayette, California 94549 USA. Phone: 925-283-2991.

1862. Ishige, Naomichi. 2008. Re: Early history of tatakhi natto, itohiki natto, and natto-jiro in Edo city, Japan. Letter (e-mail) to William Shurtleff at Soyinfo Center, March 16. 2 p. [Eng]

• **Summary:** “Tatakhi natto is minced itohiki natto, chopped with a cooking knife.

“In about the 1830s, eating granulated [regular] itohiki natto started to become popular in central Edo city (today’s Tokyo). When people had granulated itohiki natto, they stirred it and put it on hot rice with soy sauce. Before that period, itohiki natto was commonly eaten as natto-jiro, which was a kind of miso soup with tatakhi natto, greens, and tofu.

Because of this eating style, peddlers started to sell tataki natto with greens and tofu so that people could make their own natto jiru more easily and inexpensively.

Note: This is the earliest English-language document seen (Jan. 2012) that mentions or describes “Tataki natto.”

“Natto-jiru was the soup for the winter season. Starting in about the 1830s in Edo city, granulated [regular] itohiki natto began to be sold instead of tataki natto. Once people got familiar with eating granulated itohiki natto with soy sauce, peddlers started to sell itohiki natto even in the summer.

“In the well-known book *Morisada Mankô*, the author, KITAGAWA Morisada, compared the way of life in Edo, Kyoto, and Osaka in the late Edo period. He wrote that natto sellers disappeared from Kyoto and Osaka in the late Edo period. Thus, people who wanted to eat natto in the region needed to make it by themselves. Even now, although natto is popular in Kanto region, which developed around Edo city, people in Kansai region, to which Kyoto and Osaka belong, do not eat natto so much.

“I do not know any record by which the origin of tataki natto can be traced. However, it is thought that tataki natto was made from olden times as one of the basic ways of eating natto.

“Today, natto-jiru is not popular for Japanese, so tataki natto is usually not sold. If you want to have natto-jiru, you need to mince natto by yourself.” Address: National Museum of Ethnology, Osaka, Japan.

1863. Jeyaram, K.; Mohendro Singh, W.; Premarani, T.; Ranjita Devi, A.; Selina Chanu, K.; Talukdar, N.C.; Rohinikumar Singh, M. 2008. Molecular identification of dominant microflora associated with *Hawaijar*—a traditional fermented soybean food of Manipur, India. *International J. of Food Microbiology* 122(3):259-68. March 20. [29 ref] Address: 1. Microbiological Resources Div., Inst. of Bioresources and Sustainable Development (IBSD), Takyelpat Institutional Area [Manipur], India.

1864. Koblin, Seymour. 2008. Food for life: Applying Macrobiotic principles and practices to create vital health for body, mind, and spirit. Bloomington, Indiana: AuthorHouse. 180 p. Illust. (photos by Tyllie Barbosa).

• **Summary:** Miso is mentioned on 23 pages. Natto is mentioned on pages 92-103, 127, 130, 137. Tofu is mentioned on pages 114, 126, 127. Address: HHP, PhD, School of Healing Arts, San Diego, California.

1865. Cook, David Edward, III. 2008. Assessing genetic and environmental influence on traits associated with natto quality. MSc thesis, Virginia Polytechnic Institute and State University (Blacksburg, Virginia). 120 p. May 20. 28 cm. Internet resource. [62 ref]

• **Summary:** The Abstract begins: “Food grade soybean

production is a high value alternative to conventional soybean use. The production of natto, a fermented soyfood, requires soybean cultivars that consistently express specific quality traits over a range of growing environments. Therefore, it is necessary to evaluate genetic and environmental influence for natto quality traits to ensure consistent performance... Genotype x environment interactions were significant for all traits, but they did not confound selecting superior natto cultivars. Significant environment and year effects indicate environmental sensitivity, but genotype rankings rarely changed. The results indicate that genotype was the most important factor controlling the natto quality traits tested. These results suggested breeding for superior natto cultivars is possible but environmental influence must be accounted and multi environment testing is necessary for natto quality evaluation.” Address: Blacksburg, Virginia.

1866. Liu, KeShun. 2008. Food use of whole soybeans. In: Lawrence A. Johnson et al. eds. 2008. Soybeans: Chemistry, Production, Processing, and Utilization. Urbana, Illinois: AOCS Press. viii + 842 p. See p. 441-481. Chap. 14. [85 ref]

• **Summary:** Contents: Introduction. Non-fermented soyfoods: Soymilk (traditional soymilk, modern soymilk {techniques to reduce beany flavors, formulation and fortification, homogenization, thermal processing, and packaging}), tofu (preparation methods, factors involved in tofu-making {soybean varieties, storage and pretreatment, solids concentration, heating, type of coagulants, coagulant concentration, coagulation temperature, coagulation time, process automation, packaging}), varieties of tofu {silken tofu, regular and firm tofus, varieties of tofu products}), green vegetable soybeans, soybean sprouts, yuba, okara, roasted or cooked soybeans. Fermented soyfoods: Terms (Koji {fermentation, koji starter, inoculum}), fermented soy paste (preparation method {preparing rice koji, treating soybeans, mixing and mashing, fermenting, pasteurizing and packaging}), processing principles), soy sauce (preparation method {treating raw materials, koji making, brine fermentation, pressing, refining}), processing principles, chemical soy sauce), Japanese natto (preparation method, processing principles), Indonesia tempeh (processing method, processing principles), fermented soymilk, fermented tofu (preparation method, processing principles), fermented black soybeans (Chinese douchi, Japanese hamanatto). Conclusion.

Figures show: (1) Flowchart of a traditional Chinese method for making soymilk and tofu. (2) Photo of savory tofu dices. (3) Photo of soy sprouts. (4) Photo of yuba (soymilk film). (5) Photo of Chinese jiang and Japanese white and red miso. (6) Flow chart of a common method for making Japanese rice miso. (7) Photo of Japanese natto. (8) Flow chart of a traditional Indonesian method for making tempeh. (9) Photo of Chinese douchi (fermented black



soybeans or fermented whole soybeans). Address: Research Chemist, U.S. Dep. of Agriculture, Agricultural Research Service, Grain Chemistry and Utilization Lab., Aberdeen, Idaho 83210.

1867. Chie no Kai. ed. 2008. *Kyô no rekishi, bungaku o aruku* [Walking through the history and literature of Kyoto]. Tokyo Japan: Bensei Shuppan. 314 p. See p. 61. [Jap]\*

• **Summary:** Page 61: Early books about natto are *Shinsaru gakuki*, written by Fujiwara no Akihira in the middle of Heian period, *Oojorôu onna no koto*, written in the end of Muromachi period, and *Oyudono no ue no Nikki*.

Note: The Heian period in Japan lasted from AD 794 to 1185. The Muromachi period lasted from 1336 to 1573. The capital was Kyoto and the ruler was a shogun. Address: Japan.

1868. Mintz, Sidney W. 2008. Fermented beans and western taste. In: Christine M. Du Bois, C.-B. Tan, and S.W. Mintz, eds. 2008. Urbana, Illinois: University of Illinois Press. viii + 337 p. See p. 56-73. [37 ref]

• **Summary:** Contents: Introduction. The distribution of fermented legumes in local food systems. The absence of fermented legumes from Western food history. The future of fermented legumes in the West. Address: Johns Hopkins Univ., USA, emeritus professor of anthropology..

1869. Osborn, Donald Z. 2008. Soybeans and soybean products in West Africa: Adoption by farmers and adaptation to foodways. In: Christine M. Du Bois, C.-B. Tan, and S.W. Mintz, eds. 2008. Urbana, Illinois: University of Illinois Press. viii + 337 p. See p. 276-297. [48 ref]

• **Summary:** Contents: Introduction. History. Growing soybeans in Africa. Soybeans as food. Soybeans for *Daddawa*. Bean curd. Soybeans and bean curd in Niger. Other local uses. Conclusion. Notes.

A table (p. 277) shows the earliest documentation of soyfoods in West African countries. For each country is given the year first noted and the source. The countries (listed alphabetically) are: Benin, Burkina Faso (former Upper Volta), Cameroon, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Note: Most of these dates and sources are identical to those published earlier in: Shurtleff, W.; Aoyagi, A. 1997. *Soy in Africa: Bibliography and Sourcebook, 1857-1997*. Lafayette, California. Soyfoods Center.

The section on “daddawa” is very interesting and well annotated. “One relatively early and by now fairly common adaptation of soybeans to local foodways in West Africa has been its use as a substitute for seeds of the *nèrè*, or African locust bean tree (*Parkia biglobosa*).” The resulting condiment is known as daddawa (or dawa-dawa) in Hausa, *sumbala* in the Mande languages, and *iru* in Yoruba. The

physical form of daddawa may appear as a small ball, a patty, or a cluster of ripened beans, “but it is always black in color and has a very pungent odor.” The product is traded widely from the areas of production. For example, some of the daddawa sold in markets in Niger was made in Nigeria. Making daddawa is traditionally a woman’s work; it is relatively labor intensive and consumes significant amounts firewood [which in many areas is increasingly scarce].

The section titled “Bean curd” notes that a milestone in the effort to introduce tofu to West Africa took place when Osamu Nakayama, a soyfoods expert, was brought to Nigeria by the Japanese International Cooperation Agency (JICA) in 1989-91 to work with IITA in Ibadan. Working with local people, he saw the potential for making *wagashi* (also called *wara* in Yoruba [or *warangashi* in northern Benin]) the West African name of a soft unripened dairy cheese, from soybeans, curded with the traditional coagulant—the sap of the giant milkweed or Sodom apple tree (*Calotropis procera*). It took Nakayama six months of research to figure out how best to use the traditional African coagulant with soymilk. The resulting product is said to resemble the West African dairy cheese more than Asian tofu, yet it readily found its place as a substitute for the former. “It compared well with the cheese in flavor and texture, but had the important advantage of being much less expensive to produce.”

In the decade that followed, the making of African-style tofu spread largely on its own through the north of Nigeria and across the border into Niger, becoming an important new source of income for many women. As it spread, new soymilk coagulants “were identified by local producers, notably water in which tamarind fruit had been left to soak and water from rinsing pounded pearl millet, left overnight” to sour.

The section titled “Soybeans and bean curd in Niger” begins: “Soybeans have been subject to a limited amount of agronomic research in Niger and are not produced in any significant amount.” Note: This implies that soybeans have been cultivated in Niger, although in small amounts. Endnote 14 states that there have been some ongoing soybean trials in the southern part of the Dosso region.

According to American Peace Corps volunteers, tofu started to be made in about the year 2000 in the southern parts of the Zinder and Maradi regions. Since that time, tofu has been made and marketed in Niger using soybeans brought in from Nigeria, in many villages, towns, and markets, mainly in the Hausa-speaking north-central part of Niger. In 2001 it was possible to find tofu in the weekly markets of local villages in these areas, fried and sold with hot red pepper spice. “By 2002 it was more readily available in the cities of Zinder and Maradi and was produced in Birnin’Konni in the Tahoua region. By 2003 it was available in Gaya, and by midyear it was also available in Dosso town in the Dosso region.”

Like the soybean used, tofu making clearly spread along the Hausa networks that cross the border. It seems significant that the Hausa names for tofu differ between Zinder and Maradi [in south central Niger] on the one hand, where a loanword from Yoruba—*awara*—is used, and Birnin’Konni [in southwestern Niger] on the other hand, where the term used is *kwai-da-kwai*, suggesting a comparison with the texture of eggs. This suggests that different networks within the larger Hausaphone area were involved in transmitting the process for making tofu.

In Niger, making tofu is a small home-scale activity. The women who make it usually do so to coincide with weekly rural markets or, if in larger towns, several times a week or even daily to fill the demand. Three curdling agents are used. Four photos show tofu being made by an African woman in the village Guiddan Iddar, Niger, West Africa. Address: Former assoc. director for agriculture with the Peace Corps in Niger.

1870. *Nichi Bei Times (Japanese American News)*.2008. Nattô kigyô ga kitaka ni shinshutsu: “Tezukuri Nattô.” Sonoma-gun, Sebasutopooru: Shinsensa o “uri” ni jimichi na katsudô o [A natto business has recently started in Northern California: “Handmade Natto.” Sonoma County, Sebastopol: Selling freshness through slow and steady hard work]. Nov. 22. No. 16,705. p. 10. [Jap]

• **Summary:** This is coverage of an event held by Japan Traditional Foods (makers of Tezukuri Natto) at De Loach Vineyard, Santa Rosa, California, on 15 Nov. 2008. Photos show: (1) Close-up of two packages of Tezukuri Natto [“Handmade Natto”]. (2) Small mounds of Tezukuri Natto on a tray for tasting with a small wooden “food pick” stuck in each. Address: California.

1871. *BaySpo: The Japanese Weekly Entertainment Paper (San Francisco Bay Area)*.2008. Sendo batsugun no “Tezukuri Nattô” hanbai kaishi: Japan Traditional Foods [“Handmade Natto,” with superb freshness, starts to be sold: Japan Traditional Foods]. Nov. 28. No. 1047. [Jap]

• **Summary:** This is coverage of an event held by Japan Traditional Foods (makers of Tezukuri Natto) at De Loach Vineyard, Santa Rosa, California, on 15 Nov. 2008. Photos show: (1) Packages of Tezukuri Natto. (2) Dishes containing natto on a table. Address: California.

1872. *Hokubei Mainichi News (San Francisco, California)*.2008. Sebastopolu de seisan kodawari no nattô: JTF—“Hontô no mono ajiwatte” [Made in Sebastopol, California, natto with attention to details: JTF—“Let’s enjoy the taste of the real thing”]. Nov. 28. p. 2. [Jap]

• **Summary:** This is coverage of an event held by Japan Traditional Foods (makers of Tezukuri Natto) at De Loach Vineyard, Santa Rosa, California, on 15 Nov. 2008. Photos show: (1) Close-up of two packages of Tezukuri Natto

[“Handmade Natto”]. (2) JTF’s president Minami Satoh standing beside JTF’s vice-president Shun Takahashi. Both are dressed in traditional Japan clothing.

1873. *Sports J (San Francisco Bay Area)*.2008. Amerika de honmono no nattô o: Japan Toradishonaru Fûzu no “Nattô Preview Party” [Real natto is now made in America: Japan Traditional Foods “Natto Preview Party”]. Nov. 28. No. 548. p. 13. [Jap]

• **Summary:** In the section titled “Bayarea Restaurant Guide” is coverage of an event held by Japan Traditional Foods (makers of Tezukuri Natto) at De Loach Vineyard, Santa Rosa, California, on 15 Nov. 2008. Three photos. One shows Minami Satoh standing. Address: California.

1874. **Product Name:** Natto: Fermented Soy Beans. Renamed Tezukuri Natto: Fermented Soybeans in March 2010.

**Manufacturer’s Name:** Japan Traditional Foods.

**Manufacturer’s Address:** 2901 Gravenstein Hwy. No., Sebastopol, CA 95472. From March 2010: 3620 Frei Road, Sebastopol, California 95472. Phone: 707-827-1788.

**Date of Introduction:** 2008. November.

**Ingredients:** Natto: Soy beans (non-GMO), bacillus natto. Dashi shoyu: Soy sauce (soybeans, wheat, sea salt), sugar, fish, fish sauce (extract of bonito), sake (rice, koji), rice vinegar, yeast extract. Prepared mustard: Mustard, vinegar, salt, sugar, yeast extract, turmeric, spice.

**Wt/Vol., Packaging, Price:** 1.4 oz. (40 gm; 3 servings) paper cup packed with small packets of special soy sauce and mustard; 3 cups per package. Retail for \$3.99 to \$4.35 per package (\$3.99 in major markets).

**How Stored:** Refrigerated.

**New Product–Documentation:** Letter (e-mail) from Minami Satoh, founder and owner of Japan Traditional Foods Inc. Gives basic information about product at the time it was launched. “Tezukuri” means “handmade” in Japanese. The product was first sold via a Japanese distributor in Los Angeles in Nov. 2008. The first major store to carry the product was Nijiya Japanese Grocery Market in Los Angeles.

Original label with current product sent by Minami Satoh. 2010. April 22. The first label (see next page) was a line drawing (dark brown on very light brown / beige) of a traditional pack of natto wrapped in rice straw. The product was sold a small packet of dashi shoyu and a small packet of prepared mustard. When the time came to reprint the labels, he realized that the beige label looked OK, but was not especially attractive when displayed in stores. So in March 2010 he switched to a label with an orange background, dark brown illustration, and dark brown and white lettering, and he renamed the product Tezukuri Natto. The original address, 2901 Gravenstein Hwy North was the address at which the corporation was registered, but not the place where the natto was made, so he also changed that on the March 2010 label.

**Fermented Soy Beans** (Hitotsubunomegumi Tesukuri Natto)

### Nutrition Facts

Serving Size: 40g  
Servings per package: 3

Amount Per Serving	Calories 83	Calories from Fat 23	% Daily Value*
Total Fat	4.3g		7%
Saturated Fat	0.7g		4%
Trans Fat			
Cholesterol	0mg		0%
Sodium	1.5mg		0%
Total Carbohydrate	7.3g		2%
Dietary Fiber	4.6g		18%
Sugars	2g		4%
Protein	8g		2%
Vitamin A	0%	Vitamin C	0%
Calcium	5%	Iron	9%


\* Percent Daily Values are based on a 2,000 calorie diet.  
Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	less than	65g	80g
Sat Fat	less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4

**Ingredients**  
**NATTO**: Soy beans (non-GMO), bacillus natto  
**DASHI SHOYU**: Soy sauce (soy beans, wheat, sea salt), Sugar, Salt, Fish sauce (Extract of bonito, Sake (rice, koji)), Rice vinegar, Yeast Extract  
**Prepared mustard**: Mustard, Vinegar, Salt, Sugar, Yeast Extract, Turmeric, Spice

**Produced by:**  
**Japan Traditional Foods, Inc.**  
 2901 Gravenstein Hwy, No.,  
 Sebastopol, CA 95472 USA  
[www.gourmet-natto.com](http://www.gourmet-natto.com)



**Natto**  
Fermented Soy Beans



NET WEIGHT  
120g  
(4.23 oz.)

**Product of U.S.A.**  
Perishable Keep Refrigerated

In order to best enjoy *natto*, we suggest the following:  
add soy sauce and mustard or your choice of dressing and stir well.

*Natto* is a fermented food product, so it is best to consume it as soon as possible. You may occasionally notice small white spots on the surface of the *natto* beans. These are a natural result of amino acids that appear when the protein in the soybeans begins to breakdown. The *natto* is still completely safe to eat. *Natto* can be frozen, but it is best to eat the *natto* soon after it is defrosted. We recommend putting the *natto* container in a plastic bag or aluminum foil before freezing to avoid drying it out.

For healthy *natto* recipes please visit our website at [www.gourmet-natto.com](http://www.gourmet-natto.com)

Traditional foods have supported the spiritual and physical health of the Japanese people since ancient times. We formed Japan Traditional Foods to provide you the highest possible quality of *natto* and to ensure that you can enjoy *natto* not only for its unique flavor, but for the wonderful health properties in its special enzymes.

Minami Satoh, President  
Japan Traditional Foods Inc.

Fermented Soy Beans (Tezukuri Natto)

LOCALLY HANDMADE, NON GMO SOYBEANS,  
NO PRESERVATIVES, NO MSG, NO COLORS, NO ADDITIVES.

**Nutrition Facts**

Serving Size 40g  
Servings Per Package 3

Amount Per Serving		Calories from Fat 23	
		% Daily Value*	
Total Fat	4.3 g		7%
Saturated Fat	0.7g		4%
Trans Fat			
Cholesterol	0mg		0%
Sodium	1.5mg		0%
Total Carbohydrate	7.3g		2%
Dietary Fiber	4.6g		18%
Sugars	2g		4%
Protein	8g		2%
Vitamin A			0%
Vitamin C			0%
Calcium			5%
Iron			9%

\*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4

INGREDIENTS

NATTO, NON GMO SOY BEANS, BACILLUS NATTO, DASHI SHOYU, SOY SAUCE (SOY BEANS, WHEAT, SEA SALT), SUGAR, SALT, FISH SAUCE (SOY BEANS, WHEAT, SEA SALT, EXTRACT OF BONITO), SAKE, (RICE, KOJI), RICE VINEGAR, YEAST EXTRACT, PREPARED MUSTARD, MUSTARD, VINEGAR, SALT, SUGAR, YEAST EXTRACT, TURMERIC, SPICE.



PRODUCED BY:  
**JAPAN TRADITIONAL FOODS, INC.**  
3620 FREI ROAD, SEBASTOPOL, CALIFORNIA 95472  
WWW.GOURMET-NATTO.COM

TEZUKURI  
**NATTO**  
FERMENTED SOYBEANS



BLESSINGS FROM THE BEAN!

**FRESH**  
**NEVER FROZEN**  
**NON GMO SOYBEANS**  
PERISHABLE KEEP REFRIGERATED  
NET WEIGHT 120g (4.23 oz) PRODUCT OF U.S.A.

Traditional Foods have supported the spiritual and physical health of the Japanese people since ancient times. We formed Japan Traditional Foods, Inc. to provide you the highest quality of natto and to ensure that you enjoy natto not only for its unique flavor, but also for the wonderful health properties in its special enzymes. Our natto products are hand made in Sebastopol, California in a special facility with the right temperature control to create natto rich in enzymes.

佐藤 南

Minami Satoh, President  
Japan Traditional Foods, Inc.

**MAKE FRIENDS WITH NATTO'S STICKY STRINGS!**  
Natto's essential stickiness comes from its beneficial amino acid, glutamic acid. After you have eaten natto, you can easily remove any remaining traces of it from your dishes or utensils by simply soaking them in cold or hot water for 10 minutes.

In order to best enjoy natto, we suggest the following:  
add soy sauce and mustard or your choice of dressing, and stir well.

Natto is a fermented food product, so it is best to consume it as soon as possible. You may occasionally notice small white spots on the surface of the natto beans. These are a natural result of the amino acids that appear when the protein in the soybeans begins to breakdown. The natto is still completely safe to eat.

Also Enjoy Natto: In salads... On bread or crackers... With your favorite pasta... In sushi rolls...

For healthy natto recipes, please visit our website at: [www.gourmet-natto.com](http://www.gourmet-natto.com)

A restaurant package (7 oz. tray) is also available.

1875. Lee, C-H. 2008. Chungkokjang. In: Kan Kiuchi, Toshirô Nagai, and Keitarô Kimura, eds. 2008. *Natto no Kagaku: Saishin Jôhō ni yoru Sôgôteki Kôsetsu* [The Science of Natto: A Comprehensive Examination of the Latest Information]. Tokyo: Kenpakusha. viii + 285 p. See p. 224-26. 22 cm. [Jap]\*

• **Summary:** States that the first record of the production of *chungkokjang* (Korean natto) appeared in 1765 in a book written by Yoo Jung-Jim.

Note: This Japanese-language document was cited by Nagai and Tamang (2010, p. 203). Unfortunately we are not given the name of the book in which *chungkokjang* was first mentioned. Moreover, the “Jim” in the Yoo Jung-Jim does not sound like a Korean name.

1876. Tanaka, T. 2008. Pepok. In: Kan Kiuchi, Toshirô Nagai, and Keitarô Kimura, eds. 2008. *Natto no Kagaku: Saishin Jôhō ni yoru Sôgôteki Kôsetsu* [The Science of Natto: A Comprehensive Examination of the Latest Information]. Tokyo: Kenpakusha. viii + 285 p. See p. 218-21. 22 cm. [Jap]\*

• **Summary:** Pepok, which is indigenous to northern Myanmar (formerly Burma), is a close relative of Nepalese kinema and Japanese natto.

Note: This is the earliest document seen (Jan. 2012) that mentions “Pepok,” which it says is the Burmese name for a local fermented soyfood that is a close relative of Japanese natto.

1877. Tanaka, T. 2008. Sieng. In: Kan Kiuchi, Toshirô Nagai, and Keitarô Kimura, eds. 2008. *Natto no Kagaku: Saishin Jôhō ni yoru Sôgôteki Kôsetsu* [The Science of Natto: A Comprehensive Examination of the Latest Information]. Tokyo: Kenpakusha. viii + 285 p. See p. 221-24. 22 cm. [Jap]\*

• **Summary:** Sieng is a traditional fermented soyfood (and close relative of natto) indigenous to Cambodia.

Note: This is the earliest document seen (Jan. 2012) that mentions “Sieng,” which it says is the Cambodian name for a local fermented soyfood that is a close relative of Japanese natto.

1878. Aworh, O. Charles. 2008. The role of traditional food processing technologies in national development: the West African experience. In: G.L. Robertson and J.R. Lupien, eds. 2008. *Using Food Science and Technology to Improve Nutrition and Promote National Development*. See Chap. 3. [16 ref]

• **Summary:** The section titled “Dawadawa fermentation begins: Dawadawa or iru is the most important food condiment in Nigeria and many countries of West and Central Africa.” It “contributes significantly to the intake

of energy, protein and vitamins, especially riboflavin,...” A detailed description of the process for making dawadawa is given.

In 1991 Cadbury Nigeria PLC introduced dawadawa cubes, made on an industrial scale. But the product failed to make the desired market impact and was withdrawn. Address: Dep. of Food Technology, Univ. of Ibadan, Ibadan, Nigeria.

1879. Farnworth, Edward R. 2008. *Handbook of fermented functional foods*. 2nd ed. Boca Raton, Florida: CRC Press. xviii + 581 p. See p. 333, 341-45. \*

• **Summary:** Partial contents: Chapter 6. “Natto: A soybean food made by fermenting cooked soybeans with *Bacillus subtilis*.” Chapter 11. “Miso: Production, properties, benefits to health.”

Chapter 12. “Korean fermented foods: Kimchi and doenjang,” by Jeonghee Surh, Young-Kyung Lee Kim, and Hoonjeong Kwon, has a long section on doenjang, including: Cancer: Epidemiology, anticarcinogenic and antimutagenic activities *in vitro* and animal models. Cardiovascular disease: Inhibition of angiotensin converting enzymes, antithrombotic peptides, isoflavones.

Chapter 17. “Tempeh: A mold-modified indigenous fermented food.”

Two references to sufu (fermented tofu) appear on page 464.

1880. Keene, Donald. 2008. *Chronicles of my life: an American in the heart of Japan*. New York, NY: Columbia University Press. 196 p.

• **Summary:** Japanese, even taxi drivers, often start a conversation by asking me which Japanese foods I dislike. They seem disappointed when I say I like sashimi. “But they persist, asking next about *natto* (fermented soybeans), and if I say I eat *natto*, they ask in desperation if I eat *shiokara* (salted fish guts)...” (p. 11).

1881. Kiuchi, Kan; Nagai, Toshirô; Kimura, Keitarô. eds. 2008. *Nattô no kagaku: Saishin jôhō ni yoru sôgôteki kôsetsu* [The science of natto: A comprehensive examination of the latest information]. Tokyo: Kenpakusha. viii + 285 p. Index. 22 cm. [50+ ref. Jap]\*

1882. Rennie, Frank; Mason, Robin. eds. 2008. *Bhutan: Ways of knowing*. Charlotte, North Carolina: Information Age Publishing, Inc. xii + 304 p. See p. 221, 229, 230. Illust. 24 cm. [30+ ref]

• **Summary:** Each chapter is on a different basic subject by a different author or person interviewed. In Section III, Chapter 26, titled “Food Crops in Bhutan,” by Karma Lhendup begins with a definition of *Dru na gu*, the nine traditional food crops cultivated in Bhutan. The last of these is: “Pulses or legume crops such as *lebe* (soybean), *gakpu*

(mung bean / green gram), *orey* (red kidney bean / *rajma*), and *baesrem* (peas)...” in the national language (Dzongkha) (p. 221). A table (p. 223) shows that each of the nine crops has a different name in the country’s three other major languages.

“The immature peas and soybean pods are boiled and the inner part [the green beans] is eaten” (p. 229).

“The most important use of red kidney beans (*orey*) and soybeans (*lebe*) is processing them into *Lebe Yhitpa* by fermenting the half-boiled beans naturally in bamboo containers.” The resulting fermented food “typically has a pungent smell and can be used to prepare varieties of curry and *aezay* [red chili paste, a mixture of chilli powder, cheese, tomato, onion, and salt (p. 228)]. *Lebe Yhitpa* is considered to be similar to natto of Japan and Chungkok-jang of Korea” (p. 229-30). Address: British Open University [UK].

1883. Ryôri kenkyû-ka Hamauchi Chinami san totteoki nattô pawaa hyaku nijippaasento katsuyo reshipi hachijûgo [Cooking specialist Chinami Hamauchi’s specially reserved natto power 120%: 85 practical recipes]. 2008. Tokyo: Nikkeibipisha. 95 p. 28 cm. [Jap]\*

1884. Yan, Lin; Spitznagel, Edward L. 2009. Soy consumption and prostate cancer risk in men: a revisit of a meta-analysis. *American J. of Clinical Nutrition* 89(4):1155-63. April. [53 ref]

• **Summary:** The researchers found a 26% reduction in risk of prostate cancer for men with the highest soy food intake, compared to those with the lowest soy food intake. This was increased to a 30% reduction when the reported intake was of non fermented soy products (e.g. tofu, soymilk). However, fermented soy products (e.g., natto) were not associated with reduced risk. The authors concluded that consumption of soy foods is associated with a reduction in prostate cancer risk in men. This protection may be associated with the type and quantity of soy foods consumed. Address: 1. Grand Forks Human Nutrition Research Center, Agricultural Research Service, USDA, Grand Forks, North Dakota; 2. Department of Mathematics, Washington Univ., St Louis, Missouri.

1885. *Soyfoods Canada Newsletter*. 2009. Canadian soybeans—a sustainable crop. Spring. p. 4.

• **Summary:** “Canada accounts for almost 2% of the world’s soybean production. In 2007, approximately 2,700,000 tonnes [metric tons] were produced in Canada, on 2,870,657 acres (1,161,755 hectares). Soybeans are grown in three provinces: 215,006 acres in Manitoba, 434,715 acres in Quebec, and 2,224,936 acres in Ontario.

“Canadian soybean producers are known for innovative and sustainable production practices... Canada’s soybean industry is known for its superior ability to segregate and trace soybean crops from seed through to end user, referred to as Identity Preservation (IP).

“Over 40%, or about 1.7 million tonnes of Canadian-grown soybeans are exported to markets such as Japan, Malaysia, Singapore, Hong Kong and Taiwan. They are used to make Asian food staples such as tofu, miso, natto, and soymilk. Japan only produces about 12% of its own country’s food grade soybean requirements, and their consumers demand non-genetically modified product. Japanese buyers value Canadian soybeans because of our industry’s IP ability.

“Growing soybeans leaves a relatively small carbon footprint. As a legume, the soybean plant’s ability to ‘fix’ its own nitrogen virtually eliminates the need for petroleum-based nitrogen fertilizer. The wide canopy of leaves formed by soybean plants helps to minimize the need for herbicide sprays.”

1886. Bindloss, Joseph; Elliott, Mark; Horton, Patrick; James, Kate. 2009. *Northeast India*. 2nd ed. Footscray, Victoria, Australia; Oakland, California; London: Lonely Planet. 384 p. See p. 70-72. Illust. 20 cm.

• **Summary:** This is a guidebook. The section titled “Regional cuisines” (p. 70+) notes that in Sikkim [a state in northern India, nestled in the Himalayas], as in “Nepal and Bhutan, Sikkimse cooks take their inspiration from Tibet.” During “the harsh winters, Sikkimse cooks turn to fermented ingredients such as *kinema* (preserved soybeans),...”

In Meghalaya (p. 71): “Many dishes feature the pungent flavour of *tungrymbai* (fermented soybeans), similar to Sikkimese *kinema*.”

In Nagaland (p. 71-72) “many dishes are flavoured with chilli and *akhuni* (fermented soybeans).”

1887. Subba, Tanka Bahadur. comp. 2009. *Indian Nepalis: issues and perspectives*. New Delhi, India: Concept Publishing Co. xvii + 398 p. See p. 305, 310. 23 cm. Papers presented at the Conference on Identity and Nationality of the Indian Nepalis: Issues and Perspectives, held at Gangtok during 20-22 April 2006.

• **Summary:** One chapter is “Food and identity: A study of the Nepalis of Sikkim and Darjeeling,” by J.P. Tamang. Page 305: “... in Manipur a similar product is known as hawaijar; the Mizos call it Bekang-um...” “Traditional Asian fermented soybean foods” are also mentioned.

1888. Tamang, Jyoti Prakash. 2009. *Food and identity: A study among the Nepalis of Sikkim and Darjeeling*. In: Tanka B. Subba, A.C. Sinha, G.S. Nepal, and D.R. Nepal, eds. 2009. *Indian Nepalis: Issues and Perspectives*. New Delhi, India: Concept Publishing. xvii + 398 p. See p. 297-310. Papers presented at the Conference on Identity and Nationality of the Indian Nepalis: Issues and Perspectives, held at Gangtok, 20-22 April 2006. [Eng]

• **Summary:** Page 3 contains a basic description of *kinema*.

On pages 3-4 is an interesting description of “Kwanti,” which is a special food of the Newars [the indigenous people of Nepal’s Kathmandu Valley]. It is “prepared by mixing nine varieties of sprouted pulses and beans, such as white grams, dry peas, soybeans, black-eyed beans, white kidney beans, green grams, black grams, lentils and moth beans. Soybeans are soaked for 4-9 days, and other beans are soaked for 1-2 days. Sprouted beans are cooked with butter and spices to make a thick soup which is served with boiled rice. It is eaten in the festival called *Kwanti Purnima*, which usually falls in August.”

On pages 6-7 is a section titled “Antiquity of kinema” which states: “The word *kinema* has been derived from *kinamba* of the Limbu language in which *ki* means fermented and *namba* means flavour (Tamang, 2001). The kingdom of Limbuwan (presently the districts of eastern Nepal–Terathum, Taplejung, Panchthar, Dhankuta and Ilam) was established by the Limbus before the seventh century. They ruled that part of Nepal until the unification of Nepal in 1769. Though there is no historical document on the origin of kinema, it is widely believed that the Limbus started its production and consumption. The unification of Nepal and migration of people from one place to another might have popularized this food among the other Nepali groups like Rai, Tamang, Gurung, Magar and Sunuwar. Kinema is not traditionally eaten by the Nepali Brahmins. Although the reason is not documented, it is believed that the Brahmins usually regard kinema as *basi* meaning stale. Another reason may be its strong flavour. However, for many ethnic communities in the eastern Himalayas and Southeast Asian countries it is a delicacy. The Lepchas call it *satlyangser* and the Bhutias call it *bari* in Sikkim. In Meghalaya, the Khasis call it *tyrumbai* [*turangbai*]; in Manipur a similar product is known [by the Meities] as *hawaijar*; in Mizoram, the Mizos call it *bekang-um* [*bekang*]; and in Nagaland the Naga people call it *aakhuni*. It is called *natto* in Japan; *chungkok-jang* in Korea; *thua-nao* in Thailand; *pe-poke* in Myanmar and *douchi* [sic] in China.”

Fermented foods are much more numerous in North East India than in the rest of India. Address: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1889. Tamang, Jyoti Prakash; Chettri, Rajen; Sharma, Rudra Mani. 2009. Indigenous knowledge of North-east women on production of ethnic fermented soybean foods. *Indian J. of Traditional Knowledge (New Delhi)* 8(1):122-26. [21 ref]  
 • **Summary:** Contents: Abstract. Keywords. Introduction. Kinema: Introduction (it is “produced exclusively by Nepali women belonging to the Limboo and Rai castes”), indigenous knowledge of preparation (it “can be preserved for several months by drying in the sun for 2-3 days”), cuisine (recipes), economy, ethno-microbiology.

Hawaijar: Introduction (it is produced by Meitei women

in Manipur), indigenous knowledge of preparation, cuisine, microorganisms.

Tungrymbai: Introduction (it is produced by Khasi women in Meghalaya), indigenous knowledge of preparation, cuisine, microorganisms.

Aakhone: Introduction (it is produced by Sema Naga women in Nagaland), indigenous knowledge of preparation, cuisine, microorganisms.

Bekang: Introduction (it is produced by Mizo women in Mizoram), indigenous knowledge of preparation, cuisine, microorganisms.

Peruyyan: Introduction (it is produced by Apatani [not spelled Apatanai] women in Arunachal Pradesh), indigenous knowledge of preparation, cuisine, microorganisms (Chettri and Tamang unpublished).

Note 1. This is the earliest document seen (Oct. 2010) that mentions Peruyyan, a close relative of Nepalese kinema and Japanese natto.

Bio-nutrients in ethnic fermented soybeans. Conclusion. A flow sheet shows the basics of how each of these fermented soybean foods is made. For example, for Peruyyan [not spelled Peruyaan]: Wash soybeans with water and boil for 1-2 hours. Drain off excess water and cool. Pack cooked soybeans in bamboo baskets lined with ginger leaves. Keep on a wooden rack above the fireplace. Allow to ferment at 20-35°C for 3-5 days.

Note 2. In a PowerPoint presentation in 2010, J.P. Tamang stated that the major consumers of Peruyyan are the Adi, Nishi, and Apatani peoples in Arunachal Pradesh. Address: Food Microbiology Lab., Dep. of Botany, Sikkim Government College, Sikkim University, Tadong 737102, Sikkim, India.

1890. Yagihashi, Takashi; Salat, Harris. 2009. Takashi’s noodles. Berkeley, California: Ten Speed Press. An imprint of Crown Publishing Group, a division of Random House. 176 p. Illust. (photos by Tyllie Barbosa).

• **Summary:** “A collection of 75 recipes from James Beard Award-winning chef Takashi Yagihashi for both traditional and inventive hot and cold Japanese noodle dishes” (from the publisher). The pages are unnumbered.

The cover photo shows a photo of “Natto soba.” The headnotes to the recipe for “Natto soba” state: “My hometown of Mito is known throughout Japan as ‘Natto City’ in recognition of our devotion to these fermented soybeans. Natto has a wonderful nutty flavor and aroma, and I’ve loved it since I was a kid. Serving it with soba is a terrific introduction to this nutritious and ancient naturally preserved ingredient. When you open a packet of natto, the beans will be sticky and thready, but don’t let that put you off. This dish makes a beautiful presentation when it’s served. Just make sure you mix together all the ingredients very well before you eat to combine the flavors.”

1891. *BaySpo: The Japanese Weekly Entertainment Paper (San Francisco Bay Area)*. 2010. Gurume jiji tankenka: Fuyu no ichidai ibent. Fanshii Fuudo Shoo ni itte kita zoi no maki [Gourmet old-guy explorer: The biggest winter gourmet event. This article is: "I went to the fancy food show"]. Jan. 29. No. 1106. p. 15. [Jap]

• **Summary:** Over 80,000 items were exhibited. There were familiar goods too. Showed the possibilities of Japanese foods. Photos show: (1) The Kikkoman booth. (2) Marukome miso. (3) A tea both. (4) Minami Satoh standing, in traditional Japanese clothes, discussing and demonstrating his natto. (6) A Caucasian blonde girl. "A lot of Americans who attended said they liked the taste of natto." (7) Members of a miso company and a plastic container of their miso. Address: California.

1892. Shurtleff, William. 2010. Thoughts about George Ohsawa. *SoyaScan Notes*. Feb. 5. Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** There are five things I greatly admire about George Ohsawa: (1) He had a tremendous sense of gratitude for life itself and for all things. (2) He emphasized the oneness of all things (nonduality) and showed that the pairs of opposites are more deeply one. (3) He had a marvelous love of life and sense of humor. People remember him as a deeply happy and charismatic man. (4) He had a very original and creative mind—especially for a Japanese man of his time. (5) He introduced many fine Japanese foods into Western diets that Caucasians now actually eat on a regular basis—miso, tofu, shoyu / tamari, umeboshi, kuzu, sea vegetables, seitan, natto, and many more, and in doing so played a major role in starting the natural foods movement in America. Address: Founder and owner, Soyinfo Center, Lafayette, California. Phone: 925-283-2991.

1893. **Product Name:** Megumi Natto (Organic).

**Manufacturer's Name:** Japan Traditional Foods.

**Manufacturer's Address:** 3620 Frei Road, Sebastopol, California 95472. Phone: 707-827-1788.

**Date of Introduction:** 2010. February.

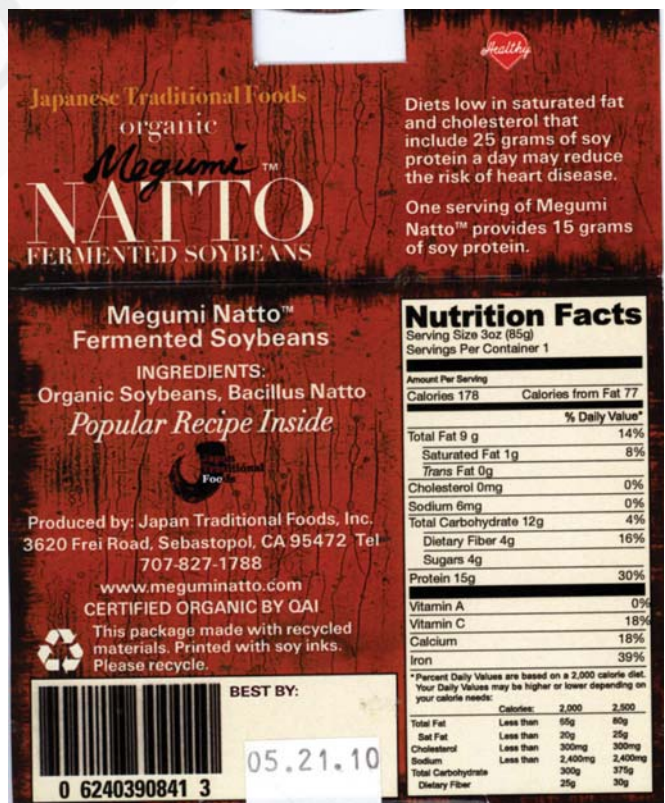
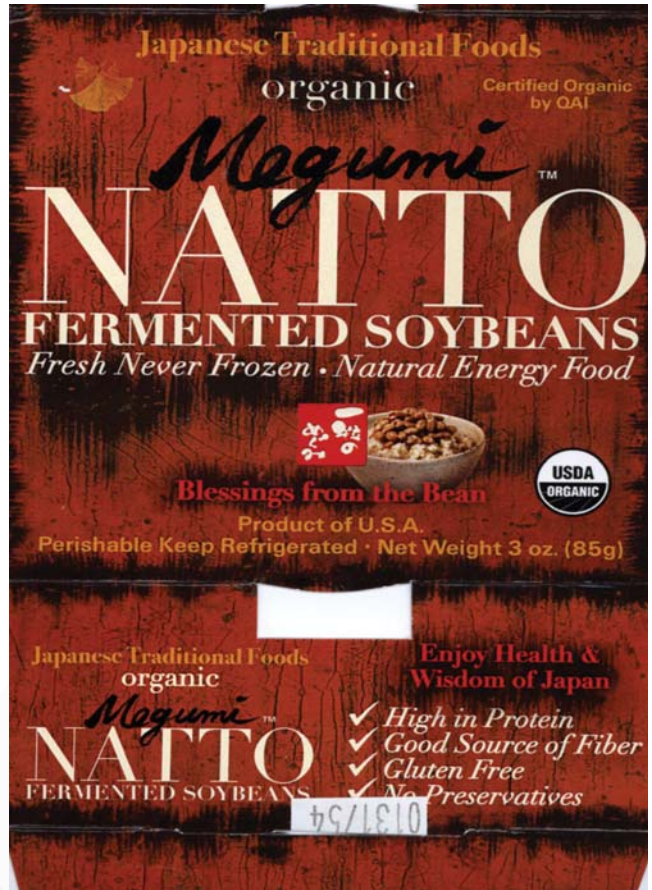
**Ingredients:** Soybeans, Bacillus natto culture.

**Wt/Vol., Packaging, Price:** 3 oz. (85 gm) plastic cup with no sauces. One cup retails for about \$2.99.

**How Stored:** Refrigerated.

**New Product–Documentation:** Letter (e-mail) from Minami Satoh, founder and owner of Japan Traditional Foods Inc. Gives basic information about product at the time it was launched. "Megumi" means "a blessing" in Japanese. For details, see [www.meguminatto.com](http://www.meguminatto.com). The package design is a shallow plastic cup. The round label is white and black on red (see next page). The soybeans are certified organic by QAI.

Product with Label brought by Tak Kimura. 2010. April 21. Plastic cup with paperboard sleeve. White, red, black,





Traditional foods have supported the spiritual and physical health of the Japanese people since ancient times. We formed JAPAN TRADITIONAL FOODS, INC. to provide you the highest quality of natto and to ensure that you can enjoy natto not only for its unique flavor, but for the wonderful health properties in its special enzymes. *Megumi NATTO™* is hand made in Sebastopol, California.

佐藤 南

Minami Satoh, President  
JAPAN TRADITIONAL FOODS, INC.

Natto is a fermented food product, so it is best to consume it as soon after purchase as possible. You may occasionally notice small white spots on the surface of the natto beans. These are a natural result of the amino acids that appear when the protein in the soybeans begins to break down. The natto is still completely safe to eat.

#### A POPULAR WAY TO EAT NATTO

1.) Steam or boil brown rice. 2.) Open *Megumi NATTO™* and peel off the plastic film. To cut the natto strings use some for stirring and wind around your utensil quickly. Do not stretch, good natto strings may stretch up to four feet. 3.) Put *Megumi NATTO™* in slightly bigger and deeper bowl (if needed) and stir beans 15-20 times. 4.) Add soy sauce and finely chopped green onion (optional) 5.) Stir again. 6.) Serve *Megumi NATTO™* over warm brown rice and enjoy!

Also Enjoy Natto: • In salad • On bread or crackers  
• With your favorite pasta • In sushi rolls

Discover more recipes and health benefits of *Megumi NATTO™* at [www.meguminatto.com](http://www.meguminatto.com)

#### MAKE FRIENDS WITH NATTO'S STICKY STRINGS!

Natto's essential stickiness comes from its beneficial amino acid, glutamic acid. After you have eaten natto, you can easily remove any remaining traces of it from your dishes or utensils by simply soaking them in cold or hot water for 10 minutes.



Blessings from the Bean

and yellow on reddish brown. On the front panel: “Organic Megumi Natto. Fermented soybeans. Fresh never frozen. Natural energy food. Blessings from the bean. Product of U.S.A. Perishable keep refrigerated.” Use by (30 day shelf life).

The paperboard sleeve is designed to be opened without damaging it so the back side can be read. Contents: About Japan traditional foods. About natto. “A popular way to eat natto.” Recipe (without any quantities) for brown rice topped with natto (mixed with a little soy sauce and green onion). “Also enjoy natto: In salad. On bread or crackers. With your favorite pasta. In sushi rolls.” Discover more natto recipes on the website [www.meguminatto.com](http://www.meguminatto.com). Make friends with natto’s sticky strings.

The new Berkeley Bowl in west Berkeley is now (23 April 2010) retailing Megumi Natto for \$2.95 per pack of 85 gm.

Taste test by Akiko Aoyagi. 2010. April. Akiko prefers the Americanized, organic version of the two natto products made by this company. Both taste very mild and both are very unsatisfactory to Akiko, who loves natto and eats it regularly. She feels like both have been dehulled. She likes a tougher texture and she craves a stronger (less mild) taste. The price of this natto is 3 times higher than the natto she buys locally. She does not care whether a natto product is organic or not. The American design is too busy (*gocha-gocha*).

1894. Carr, Stephen. 2010. Patience a virtue in miso making: Englishman Tony Flenley sticks with tradition, keeps 105-year-old Osaka business alive. *Japan Times*. April 3. [Eng]

• **Summary:** Flenley is the managing director of Osaka Miso Jozo in central Osaka. He has run the company for 20 years—since April 1990. Flenley first came to Japan in 1977 after graduating from the University of Swansea, South Wales. He worked as an English teacher and married a local Japanese girl whose father had been running a well-established miso business since several years after World War II.

Consumption of miso has been decreasing in Japan and the quality has been going down as large manufacturers (and consumers) focus on low-price products. “Flenley believes that ‘the insistence on cheap prices by supermarkets’ is killing Japanese food culture. ‘It’s not just miso. If food producers are continually forced to keep prices down, they can survive only by making inferior products. The Japanese are getting used to the taste of cheap food.’

“Another example, he says, is natto fermented soybeans, which are only half fermented when you buy them in a supermarket. If you eat it a couple of weeks after the sell-by date, it will be properly fermented!”

“Domestic consumption is down, with 1,300 miso manufacturing plants nationwide compared with 1,600 a decade ago. Production is 520,000 tons, as against 560,000

tons at the beginning of the decade. But miso exports today stand at 6,200 tons, more than double the 3,000 at the turn of the century.”

Photos show: (1) Flenley, with arms folded, standing in front of 50-year-old wooden barrels where red miso is aged for two years. (2) Flenley works with an employee at the 105-year-old miso company. Address: Tokyo.

1895. Japan Traditional Foods. 2010. Natto: Fermented soybean (Website printout—all). [www.meguminatto.com](http://www.meguminatto.com). 10 p. Printed April 10.

• **Summary:** A very attractive, stylish, professional, informative, and innovative website by Planeteria Web Design. Contents: Home. About natto (Plus Frequently Asked Questions). History. Health benefits. Products (Megumi Natto, Tezukuri Natto). Recipes (24 natto recipes plus an excellent 3½-minute video titled “How to prepare natto” featuring Minami Sato). Order. Press. Where to buy (retail, in California, Oregon, or Washington. Tezukuri natto is much more widely available than Megumi Natto). Our company. Contact us.

Note: The URL [www.gourmet-natto.com](http://www.gourmet-natto.com) redirects to this URL / website. Address: 3620 Frei Road, Sebastopol, California 95472. Phone: 707-827-1788.

1896. *SoyaScan Notes*. 2010. The life and work of Minami Satoh, natto maker in Sebastopol, California (Overview). April 11. Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** 1957 April 2—Minami Satoh was born in Japan to father Fumio Satoh and mother Hisae Okazaki. Fumio Satoh, was founder and President of Satoh Steel Pipe Co. Ltd, a wholesaler of steel pipes and tubes.

1981 March—Minami graduated from Keio University, Law department in Tokyo, Japan, with a Bachelor of Arts degree. Minami had an interest in becoming an international business person. So in late March, 1981, while awaiting admission to American Graduate School of International Management, (Thunderbird), in Glendale, Arizona, he arrived in the USA and began to attend the Economic Institute in Boulder, Colorado; he took English classes, which helped to prepare him to study business.

1981 Sept.—Minami officially began studies at Thunderbird.

1983 Jan.—He graduated from Thunderbird. Minami lived in the U.S. for one and a half years earning his degree, Master’s International Management.

1983-1988—Minami worked for DuPont in Japan, as a marketing representative, marketing Corian (artificial marble).

1989-2006—He worked for his father’s company Satoh Steel Pipe Co., Ltd. wholesaling steel pipes and tubes. While successful, this work was not of much interest to him, thus he pursued diversifying the company.

2003—during this research phase, he met a Japanese

American who was planning to import natto snacks to the U.S. at a trade show in Tokyo, Japan. Minami had interest in a business that had multi-cultural dynamics. However this particular project did not succeed financially.

2005—Minami then had the opportunity to purchase majority shares of a small natto-making company named Yaguchi Natto Manufacturing Company, now Yaguchi Foods Co., Ltd. in Japan. Shortly after this time, the owner died; and his relatives sold the company to Minami.

The company address is 1-30-29 Numakage, Nimai-ku, Saitama City, Saitama prefecture, Japan. Yaguchi Foods makes only natto, however they sell other soybean related foods such as tofu. The company has 35 people on the payroll including part-time employees.

Minami believed fresh and hand-made natto would have the opportunity to sell in the U.S. with its milder aroma and taste compared to frozen imported natto—and that it could become popular like other soyfoods such as tofu, edamame, miso, soy sauce, soymilk and tempeh.

2005—Minami came to the United States to meet Malcolm Clark (The great grandson of Dr. William Smith Clark {graduated Amherst College, 1848}, who was the first chairman of the agricultural college in Hokkaido, Japan, and is still quite famous.)

Malcolm Clark, founder of Gourmet Mushrooms, Inc. has since retired. While studying in Japan, he was chosen to be one of two principal students of Dr. T. Yoshii, the innovator of the use of sawdust as a substrate for growing mushrooms. With this knowledge, Malcolm returned to North America and collaborated with a group of Japanese-Canadians to start the cultivation of shiitake mushrooms. During this period, he met David Law and in 1976 the idea of Gourmet Mushrooms, Inc. was hatched.

In 1977, he and David (now CEO) founded Gourmet Mushrooms Inc. and began building their dream of commercial cultivation of exotic mushrooms in Sebastopol, Sonoma County, California.

Malcolm Clark now lives in Occidental, California.

Minami hoped that Malcolm Clark would give him some good advice about how to market natto in the USA. When he met Mr. Clark, the latter was thinking of retiring.

Minami chose to buy some shares of Gourmet Mushrooms, to share resources and create synergies between his Natto company and Gourmet Mushrooms.

2006 Feb. 24—Minami founded Japan Traditional Foods, as a corporation in Sebastopol, California, for the production and sale of food, namely natto.

2008 June—Minami moves to the United States from Tokyo, Japan to manage Japan Traditional Foods. The company presently has two employees, Minami Satoh and Dallas Akimoto. In the beginning Shun Takahashi, joined him from his natto company in Japan. Shun made the natto and Minami was in charge of running the company and marketing the natto until 2009, November.

2008 Nov.—Japan Traditional Foods starts selling its first natto product, Tezukuri Natto (Tezukuri means “hand made” in Japanese), through a Japanese distributor in Los Angeles. The first important retail outlet was Nijiya Japanese Grocery Market.

2008 Nov. 15—Natto Preview Party held at Deloache Vineyard in Santa Rosa.

2009 June 27-28—Tezukuri Natto Demonstration at Mitsuwa Market Place in San Jose, California.

2009 Aug. 8-9—Tezukuri Natto Demonstration at Mitsuwa Market Place in Costa Mesa, California.

2009 May 12—Seth Roberts, in his Wellsphere blog, writes a good history of Minami Satoh’s work to date.

2010 Jan. 18—Japan Traditional Foods introduces organic Megumi Natto at Fancy Food Show in San Francisco, California.

2010 April 20—Launch celebration event for organic Megumi Natto at Ozumo Restaurant in San Francisco, California.

Note: Mr. Satoh lives in Santa Rosa, California, with his wife and daughter and travels regularly to Japan. As owner of Yaguchi Foods, he continues to oversee production and sales of natto in Japan.

1897. Nishito, Yukari; Osana, Yasunori; Hachiya, Tsuyoshi; Pependorf, K.; et al. 2010. Whole genome assembly of a natto production strain *Bacillus subtilis* natto from very short read data. *BMC Genomics* 11:243+. April 16. [40 ref]

• **Summary:** This is an open access article: Abstract: *Bacillus subtilis* natto is closely related to the laboratory standard strain *B. subtilis* Marburg 168, and functions as a starter for the production of the traditional Japanese food “natto” made from soybeans. Although re-sequencing whole genomes of several laboratory domesticated *B. subtilis* 168 derivatives has already been attempted using short read sequencing data, the assembly of the whole genome sequence of a closely related strain, *B. subtilis* natto, from very short read data is more challenging, particularly with our aim to assemble one fully connected scaffold from short reads around 35 bp in length.

“Results: We applied a comparative genome assembly method, which combines *de novo* [new] assembly and reference guided assembly, to one of the *B. subtilis* natto strains. We successfully assembled 28 scaffolds and managed to avoid substantial fragmentation. Completion of the assembly through long PCR experiments resulted in one connected scaffold for *B. subtilis* natto.”

Conclusions: The determination of the whole genome sequence of *Bacillus subtilis* natto provided detailed analyses of a set of genes related to natto production, demonstrating the number and locations of insertion sequences that *B. subtilis* natto harbors but *B. subtilis* 168 lacks. Multiple genome-level comparisons among five closely related *Bacillus* species were also carried out. The

determined genome sequence of *B. subtilis* natto and gene annotations are available from the Natto genome browser <http://natto-genome.org/>. Address: 1. Dep. of Biosciences and Informatics, Keio University, Hiyoshi, Kohoku-ku, Yokohama, Japan.

1898. Japan Traditional Foods. 2010. Japan Traditional Foods announces availability of organic Megumi Natto, fermented soybeans, in California markets (News release). Sebastopol, California. 4 p. April 19.

• **Summary:** Contents: Introduction. About Japan Traditional Foods. Minami Satoh, President & founder Japan Traditional Foods, Inc. (brief biography). Megumi Natto frequently asked questions: Why did you bring natto to the United States? Why did you choose Sebastopol, California, to produce natto? How long does your natto fermentation process take? (about 20 hours). Your natto tastes and smells far milder than frozen natto I have tried, why? What are natto's health benefits? What is natto's shelf life (1 month). Is it possible to cook hot dishes with natto? (When the enzyme nattokinase is heated to 150 degrees Fahrenheit or warmer for more than 10 minutes, it may lose its effectiveness. So better to add natto to hot dishes at the end of preparation). What are the white spots on the beans? (As natto continues to ferment, the proteins start to break down into amino acid crystals. They are safe to eat). Is it normal for natto to be so stringy? (Yes. The sticky strings (a form of glutamic acid) include the enzyme nattokinase).

The Introduction states: "Made in small batches in Sebastopol, CA, Megumi Natto is the first to offer this organic option."

"During fermentation a beneficial bacteria, *Bacillus natto*, is added to the soybeans. This results in the production of the enzyme Nattokinase. This enzyme has been found to dissolve blood clots and thin blood. Megumi Natto is high in protein, good source of dietary fiber, and rich in vitamin B2 & K2."

"Megumi Natto is now available in 3 ounce containers in selected grocery and natural food markets in Northern California including: Andy's in Sebastopol, Community Market in Santa Rosa, Berkeley Bowl West in Berkeley. Rainbow Grocery and Tom's Natural Foods in San Francisco." Address: 3620 Frei Road, Sebastopol, California 95472. Phone: 707-827-1788.

1899. Megumi Natto. 2010. Invitation: Please join us to celebrate introduction of organic Megumi Natto (TM). Sebastopol, California. 1 p. Sent as attachment to an e-mail. • **Summary:** This is a promotion and tasting event for Megumi Natto at a San Francisco restaurant. "Fresh, Never Frozen, Natural Energy Food, First to USA.

"Megumi Natto (TM) hor d'oeuvres prepared by Ozumo [restaurant]. Complimentary sake. 161 Steuart Street, San Francisco, California 94105. T: 425.882.1333. [www.ozumo.com](http://www.ozumo.com).

com.

"Tuesday, April 20, 2010. 5:00–7:00 pm.

"RSVP: [meguminatto@gmail.com](mailto:meguminatto@gmail.com) [www.meguminatto.com](http://www.meguminatto.com)." Address: [Sebastopol, California].

1900. Kimura, Takuji "Tak." 2010. Visit to event promoting the launch of Megumi Natto in San Francisco (Interview). *SoyaScan Notes*. April 21. Conducted by William Shurtleff of Soyinfo Center.

• **Summary:** Tak and his wife arrived a little late last night at the stylish, upscale Japanese restaurant "Ozumo" in San Francisco where the Megumi Natto promotion was already underway. The place was jam packed with more than 50 media reporters, about half being Japanese and half Caucasian. Tak thinks there were no consumers—only mass media people. All the action was at a small bar (where alcoholic beverages are usually served) in the restaurant, where Mr. Minami Sato, founder and president of Japan Traditional Foods, rented the space.

Four natto dishes were served, each brought around on trays by waitresses. These five included: (1) Cooked egg (*dashimaki tamago*) topped with natto. (2) Nori-wrapped sushi with natto plus a dab of *umeboshi* (salt-pickled plum) on top. (3) Fried tofu stuffed with natto. (4) Cucumber and asparagus sushi roll (large) topped with diced (*hikiwari*) natto. Tak could hardly hear anything that was said, the noise was so loud. The bar was small and no microphones were used. However the response was very, very good. Everyone seemed to be enjoying the prepared natto dishes.

After the sampling Tak and his wife went to the sushi bar in Ozumo and enjoyed six pieces of sushi each—for \$100. A very, very expensive restaurant.

At the event, Tak purchased one case (12 x 3 oz cups) for \$32.28. On refrigerated products, wholesalers usually take a 30% margin and retailers usually take a 30-40% margin. Address: 3616 Delancey Lane, Concord, California 94519-2357. Phone: (925) 687-2422.

1901. Hu, Yongjin; Ge, C.; Yuan, W.; Zhu, R.; Zhang, W.; Du, L.; Xue, J. 2010. Characterization of fermented black soybean natto inoculated with *Bacillus natto* during fermentation. *J. of the Science of Food and Agriculture (London)* 90(7):1194-1202. May. [32 ref]

• **Summary:** Cooked black soybeans were inoculated with *Bacillus natto* and fermented at 37 degrees C for 48 hours. Genistin and daidzin concentrations gradually decreased with increased fermentation time. However, genistein and daidzein increased with fermentation time. DPPH stands for 2, 2-Diphenyl -1- Picrylhydrazyl.

DPPH radical scavenging activities of the fermented black soybeans increased linearly with fermentation time. Compared with the soaked black soybeans and cooked black soybeans, the fermented black soybeans with *B. natto* resulted in higher scavenging activity towards DPPH

radicals, which correlated well with the content of total phenols, and aglycone isoflavone.

Conclusion: This new food has the potential to become a functional food because of its high antioxidant activity. Address: School of Food Science and Technology, Yunnan Agricultural University, Kunming City, Yunnan Province 650201, China.

1902. Cober, Elroy. 2010. How important have day-neutral / photoperiod insensitive soybean varieties been in the movement of soybeans northward in Ontario? (Interview). *SoyaScan Notes*. June 11. Conducted by William Shurtleff of Soyinfo Center.

• **Summary:** Day-neutral (also called photoperiod insensitive) varieties and their genes have played a supporting role but not the leading role in helping soybeans to move northward. The leading role has been played by earliness traits and genes. Actually, the two are interconnected.

There is a series of 8-15 maturity genes in soybean; at each one of those maturity genes you can have a late version or an early version. It's like two-way switch that is switched to either late or early. As you accumulate genes that have early versions, you get earlier and earlier. The day-neutral genes are a subset of the maturity genes. Some of these genes we recognize because they provide day neutrality. It's different language but it refers to the same thing. Day neutral is early. We talk about "day neutral" because it is something that we can see, and it is dramatic. It was talked about before we had a clear understanding of the individual genes. We breeders still talk about it some because it's easy to characterize. We grow the soybean plants in a place where they receive 20 hours a day of sunlight. If they flower and mature normally, we call them "day neutral" or "photoperiod insensitive." Twenty hours is a recognized cut-off point because it is so extreme. That concept of 20 hours started to be used in the early 1980s. Harvey Voldeng and Richard Buzzell (at the Harrow Research Station) did work on that. There are two genes that are important for the trait of day neutrality, and both must be switched to early. It gets complicated. Examples of important soybean varieties that are day neutral in Ontario are Maple Presto (the first such variety released) and Maple Ridge. Maple Presto and Maple Ridge are now grandparents of the varieties widely grown today. The leading soybean varieties today are recognized for their earliness and not so much for their day neutrality. Today "day neutrality" is sort of trick that breeders use to get an easy handle on earliness. If a soybean variety has day neutrality, then its offspring are going to have a better chance of maturing early.

Most farmers have switched over to Roundup-Ready soybeans from publicly-bred soybeans so it's hard for Dr. Cober to know what is going on in the genetics of these privately bred soybeans. The Roundup Ready traits have

nothing to do with earliness. In Canada today, privately bred Roundup Ready soybeans have about 50% of the market and publicly bred soybeans have the other 50%. Roland is publicly bred and adapted for Manitoba but it does not play such an important role because Manitoba farmers grow mostly Roundup Ready soybeans rather than "conventional soybeans." Two of Dr. Cober's new natto varieties that are very early and well adapted to Manitoba are also daylength insensitive. He breeds these natto soybeans to give farmers in the north the option of participating in that premium market in Japan.

Dr. Cober's focus as a soybean breeder in Ottawa is on specialty type soybeans—meaning natto, high protein, and tofu. They have a tofu lab in Ottawa that tests their tofu soybeans. The grain quality person at Ottawa, Judith Frégeau-Reid, contacted Soyinfo Center recently to ask questions about evaluating tofu quality.

Dr. Harvey Voldeng, former soybean breeder at Ottawa adds (June 11): Of the old varieties, either Portage (from B. Stefansson in Manitoba) or the variety Acme (from Ottawa) were probably photoperiod insensitive. This was not known at the time the varieties were released; but when they were tested later, they were found to be insensitive. Address: Soybean Breeder, Agriculture Canada, Central Experimental Farm (CEF), Building #110, Ottawa, ONT K1A 0C6, Canada. Phone: 613-759-1610.

1903. Yoshikawa, Yoko. 2010. Evaluation of natto soybean seed quality attributes and sensory properties. MSc thesis, University of Arkansas, Fayetteville. xiii + 139 leaves. 28 cm. \*

Address: Fayetteville, Arkansas.

1904. Andoh, Elizabeth. 2010. *Kansha: Celebrating Japan's vegan and vegetarian traditions*. Berkeley, California: Ten Speed Press. vii + 296 p. Illust. (color photos by Leigh Beisch). Index. 25 x 25 cm.

• **Summary:** A beautiful book, and a major contribution toward understanding Japanese cuisine, culture, and the pervasive spirit of gratitude / appreciation. In Japanese, *kansha* means appreciation or gratitude. Contents: Acknowledgments. Introduction: A historical perspective on *kansha* (*shojin ryori* is vegan), recent developments, putting theory into practice, practicing *kansha*, meal planning, some final thoughts, a note about language. Rice. Noodles. Stocks and soups. Fresh from the market. The well-stocked pantry. Mostly soy. Tuskémono [pickles]. Desserts. A guide to the *kansha* kitchen. A catalog of tools and techniques. A catalog of ingredients [glossary]—with entries that include the following: daikon, edamame, flours (kinako), kudzu, herbs, spices and seasonings (ao nori, sansho, shiso, togarashi, wasabi), kabocha, dried beans (adzuki [sic], daizu {dried soybeans—the most important legumes in the Japanese pantry}), dried soy foods [sic] (hoshi yuba {dried yuba},

koya-dofu / kori-dofu). Dried vegetables from the land (dried shiitake mushrooms). Dried vegetables from the sea (arame, hijiki, kanten, kombu [konbu]). Dried wheat gluten. Kasu (sake dregs). Konnyaku and shirataki. Matcha. Miso (red miso, white miso, genmai miso). Mushrooms. Natto. Nigari. Nuka. Okara. Pickles. Rice. Roots and tubers. Saké. Salt. Sesame (seeds, sesame paste, sesame oil). Soy milk [sic]. Soy sauce. Sweeteners (ama-zaké, kuro-zato, mirin, mizu amé). Tofu (firm tofu, silken tofu, grilled tofu, thin fried tofu {abura agé}, thick fried tofu {atsu agé}). Tsukemono (pickles). Umeboshi (pickled plums). Vinegar. Yuzu. Yuba.

Note: This is the earliest English-language document seen (Jan. 2011) that uses the term “thin fried tofu” to refer to abura agé / deep-fried tofu pouches, or the term “thick fried tofu” to refer to atsu agé / deep-fried tofu cutlets.

Contains many recipes that use tofu, miso, soy sauce, edamame, natto, etc. Address: Japan.

1905. Kiuchi, Kan; Nagai, Toshiro; Kimura, Keitaro; Kodaka, Kaname; Muramatsu, Kanako; Watanabe, Sugio. 2010. *Nattô no kenkyû-hô* [How to conduct research on natto]. Tokyo: Koseisha Koseikaku. 207 p. 22 cm. [Jap]\* Address: Japan.

1906. Koizumi, Takeo. 2010. *Nippon zenkoku nattô daihakurankai*. [The great nationwide Japanese natto exhibition]. Tokyo: Tokyo Shoseki. 125 p. 16 cm. [Jap]\* Address: Japan.

1907. Nagai, Toshiro; Tamang, Jyoti Prakash. 2010. Fermented legumes: Soybean and non-soybean products. In: Jyoti P. Tamang and K. Kailasapathy, eds. 2010. *Fermented Foods and Beverages of the World*. Boca Raton, Florida: CRC Press / Taylor & Francis. xii + 448 p. See p. 191-224. [125 ref]

• **Summary:** An ethnic fermented food is one used by a certain ethnic group Contents: Introduction. Fermented soybean foods: Bacilli-fermented, sticky and nonsalty soybean foods (natto, kinema, thua nao, chungkokjang, hawaijar, tungrymbai, aakhone, bekang, perayaan, pepok, sieng), mold-fermented soybean foods (tempe, douchi, sufu, doenjang, miso, shoyu / soy sauce, tauco).

Fermented non-soybean legume foods: Dawadawa (preparation and culinary, microbiology), ugba (preparation and culinary, microbiology), maseura (preparation and culinary, microbiology), wari (preparation and culinary, microbiology), oncom (preparation and culinary, microbiology), dhokla and khaman (preparation and culinary, microbiology). Conclusion.

Among the Bacilli-fermented, sticky and nonsalty soybean foods, natto, for example, has the following contents (p. 194-96): Introduction, history, preparation and culinary, socioeconomy, microbiology and food safety, biochemistry, nutritional composition, and functional properties. Kinema

and thua-nao similarly subdivided, however some lesser-known soyfoods and some non-soy foods are described in less detail.

The Introduction (p. 192-93) discusses Dr. Tamang's revised “KNT triangle” theory, with two maps. “Within the proposed triangle-bound countries, many fermented sticky nonsalty soybean foods are consumed by the different ethnic groups of people in Cambodia, Laos, Vietnam, Darjeeling hills and Northeast states of India, eastern part of Nepal, southern part of Bhutan, Myanmar, and southern parts of China (Figure 6.2). Beyond this hypothetical ‘KNT triangle’ there is no report of kinema-like products that are sticky and ammonia-flavored fermented soybean foods, and the proposed ‘KNT triangle’ does not include salted, nonsticky and non-bacilli fermented soybean products such as *tempe*, *miso*, *sufu*, *soy sauce*, etc. (Tamang 2010).”

Fermented soyfoods can be classified in various ways: (1) Those fermented by bacteria (primarily *Bacillus subtilis*), such as natto, thua nao, kinema, etc. (all have a characteristic stickiness), and those fermented by molds, such as soy sauce, miso, tempeh, etc. (2) Nonsalted (those to which no salt has been added, such as natto, kinema, tempeh), and salted (such as soy sauce, miso, douchi, etc.) (p. 194). Pepok (p. 207) is an ethnic fermented soyfood from northern Myanmar (formerly Burma). To make pepok: Soak soybeans in water overnight, drain, and bring to a boil. Then wrap in leaves and allow to ferment for 2-4 days. Mash the fermented beans with salt and hot chili pepper, roll out into disks, and dry in the sun. Use as a seasoning or consume after roasting.

Sieng (p. 207) is a traditional fermented soyfood from Cambodia. To make sieng: Soak soybeans in water overnight, drain, and bring to a boil. Spread in shallow bamboo baskets and allow to ferment naturally for 2 days by bacteria adhering to the baskets or suspended in the air. Then immediately transfer the fermented soybeans to salt water and soak for 5-7 days; occasionally tree sap or enzymes are added to the salt water. Use with salt and spices as a seasoning.

Tables: (1) Nutritional composition of boiled soybeans (as a control), natto, and tempe [incl. vitamins, minerals, and fatty acids]. (2) Nutritional composition of kinema and raw soybeans.

Figures (photos unless described otherwise): (1) Map of the natto triangle (based on Nakano 1972). (2) Stylized map of the KNT (kinema–natto–thua nao) triangle. (3) Chopsticks lifting up natto from a polystyrene paper package. *Bacillus subtilis* (natto) produces a polyglutamate, a viscous material, which is called *ito*, meaning “string,” in Japanese. (4) Natto in a classical package made of rice straw. (5) A bowl of kinema–freshly fermented. (6) Kinema curry in a bowl and on a plate. (7) Thua nao in a plastic bag, with the label in Thai. (8a) The front of a package of chungkokjang, labeled in Korean, with a photo on the label of the product in a thick spicy stew (*chigae*). (8b-c) Top view and side view of

a mound of chungkokjang. (9a) The front of a package of Rusto's Tempeh. (9b-c) Top view and side view of a cake of tempe. The spaces between soybean cotyledons are packed tightly with white mycelia of *Rhizopus oligosporus*. Address: 1. Genebank, National Inst. of Agrobiological Sciences, Tsukuba, Japan; 2. Food Microbiology Lab., Sikkim Government College, Sikkim Univ., Gangtok, Sikkim, India.

1908. Richmond, Simon. 2010. Lonely Planet Korea. 8th ed. Footscray, Victoria, Australia; Oakland, California: Lonely Planet. 440 p. See p. 188. Illust. (some color). Maps (some color). Index. 20 cm.

• **Summary:** This is a guidebook to Korea. including North Korea. 110 maps. "In the year 2000 the Korean government adopted a new method of romanising the Korean language. Most of the old romanisation system was retained. The new system is used throughout this book (p. 411)

*Ganjang* (soy sauce) is mentioned on pages 68, 69, 70, 75, 178 and 188.

Page 188: In Gangwon-do, "Gangneung's prized specialty is *sundubu*, soft or uncurdled tofu [soymilk curds] made with sea water in Chodang, the 'tofu village.' At its plainest, *sundubu* is served warm in a bowl, with *ganjang* (soy sauce) on the side. It can also be prepared in *jjigae* (stew) or *jeongol* (casserole)."

In Chodang, there are about 20 restaurants, one of the most well-known of which is Chodang Halmeoni.

*Sundubu* (soymilk curds or soft uncurdled tofu) is mentioned on pages 72, 78, 186, 188 and 189.

*Doenjang* (fermented soybean paste) is mentioned on pages 56, 68, 70, 78, 134, 188, 246, 257 (spelled *twenjang*) and 346.

*Doenjang jjigae* (soybean paste stew) is mentioned on pages 78, 134, 188, and 246.

Tofu (*dubu*) is mentioned on pages 70-74, 78, 127, 134, 136, 179, 188, 294, and 388.

Soft tofu is mentioned on pages 204, 257, 299.

1909. Sumi, Hiroyuki. 2010. Nattô wa kiku: kaimei sareta nattô, pawaa no himitsu [Natto works: It has now been made clear, natto is the secret to power]. Tokyo: Dainamikkuseraa Zushuppan. 270 p. 19 cm. [Jap]\*

1910. Tamang, Jyoti Prakash. 2010. Himalayan fermented foods: Microbiology, nutrition, and ethnic values. Boca Raton, Florida: CRC Press. xix + 295 p. See p. 65-78. 230-31, 233. Illust. 25 cm. [584 ref]

• **Summary:** This is a very interesting, original, well researched and well written book. It is also the best source of detailed, well documented information on kinema and its close relatives seen to date.

The word Sanskrit word Himalayas means literally "abode of the snows." This region is the home of over 65 million people. Those in the eastern Himalayas are of

Mongolian ethnicity and ancestry.

Chapter 3, titled "Fermented legumes," includes a section titled "3.1 Important fermented soybean foods" which states (p. 65): "Some of the common ethnic nonsalted sticky fermented soybean foods of the eastern Himalayas are *kinema* (Nepal, Darjeeling hills, Sikkim, and South Bhutan), *hawaijar* (Manipur), *tungrymbai* (Meghalaya; food of the Khasi and Garo peoples), *bekang* (Mizoram; food of the Mizo people), *aakhone* (also called *axone*, Nagaland; food of the Sema Naga), and *peruyyan* (Arunachal Pradesh). Manipur, Meghalaya, Mizoram, Nagaland, and Arunachal Pradesh are small states in northeastern India.

All of these foods are similar to *kinema*.

Note: As a guide to the Seven Sister states of North East India, we are including a color map of the area created for Soyinfo Center - see front of book.

For all these six foods is given: The name of the food, a close-up photo of the food, indigenous knowledge of preparation, a flow chart showing the indigenous method of making the food, culinary practices (how the food is prepared / cooked and eaten), economy (its role in the local economy), microorganisms (dominant and secondary).

Section 3.3 is "Microbiology" (of fermented legumes): Kinema (microorganisms, source of inoculation in kinema production optimization of fermentation period, in situ fermentation of kinema, selection of starter culture, monoculture fermentation of kinema, development of pulverized starter for kinema production, phylogenetic similarity of *Bacillus* strains from Asian fermented soybeans), other fermented soybean foods of north east India.

Section 3.4 is "Nutritive value" (table 3.1 compares the nutritional composition of raw soybean and kinema). And section 3.5 is "Conclusion."

The long and very interesting section (9.1.1) on the "Antiquity of kinema" (p. 230-34) states that it is a food of the Kirat ethnic group (to which the Limboo belong) of eastern Nepal. The origin of the word "kinema" can be traced back to the word *kinaba* of the Limboo language (*ki* = fermented; *namba* = flavor). It is not clear whether *kinema* appeared first, then was disseminated and diversified, or vice versa. The Limboo believe that their discovery and domestication of the soybean (which they named *chembi*) is mentioned in one of their oral myths, as explained here.

Kinema is made by fermenting whole soybeans, without inoculation, with strains of *Bacillus subtilis* bacteria. It is alkaline in nature / pH, has a sticky, stringy texture and a strong flavor.

Natto is believed to have been introduced to Japan from China during the Nara period around 710-714 AD (Ito et al. 1996; Kiuchi 2001). Kinema might have originated in east Nepal around 600 B.C. to 100 A.D. during the Kirat dynasty.

Products closely resembling kinema are popular foods in many non-Brahmin communities in the eastern Himalayas.

“The Lepcha [the aboriginal inhabitants of today’s Sikkim] call it *satlyangser*; the Tibetans and Bhutia [of Bhutan and Sikkim] call it *bari*; the Khasi [of Meghalaya] call it *tungrymbai*; the Meitei [of Manipur] call it *hawaijar*; the Mizo [of Mizoram] call it *bekang*; the Sema Naga [of Nagaland] call it *aakhone*; and the Apatani [of Arunachal Pradesh] call it *peruyyan*.”

Soybean products closely resembling kinema outside of the Himalaya region are *natto* of Japan, *chungkokjang* of Korea, and *thua-nao* of Thailand [From Google Books Preview].

Dr. Sasuke Nakao (1972) coined the term “natto triangle,” but Dr. Tamang proposes that the hypothetical triangle be renamed “Kinema–Natto–Thua-nao triangle” (or KNT triangle).

Note: Four facts support Dr. Tamang’s elegant new triangle:

(1) Indonesia and its mold-fermented tempeh should not have been part of the original natto triangle.

(2) Nakano (1972) guessed that natto might have come to Japan from Java during the Muromachi period, however extensive research on natto and tempeh after 1972 offers no support to his guess.

(3) Many new relatives of natto have been discovered since 1988, many of them by Dr. Tamang and co-workers. All of these (except the relatives of dawadawa made from soybeans found in West Africa) fall within the KNT triangle.

(4) No mold-fermented soyfoods—such as tempeh, miso, soy sauce, jiang, or fermented tofu—fall within the new KNT triangle.

An illustration / map (Fig. 9.1) shows this improved triangle with Japan (natto), Nepal-India-Bhutan (kinema), and Thailand (thua nao) at its three vertices / corners; it also includes chungkokjang (Korea), pepok (Myanmar), sieng (Thailand), and [incorrectly, mold-fermented] *douche* [*douchi*] from south China. These mildly alkaline, sticky fermented foods are popular among the peoples of Mongolian origin. This may be due to their typical flavor called *umami* (Kawamura and Kara 1987). This flavor is developed during the hydrolysis of soy protein (by protease enzymes) into amino acids during fermentation. Have people of Mongolian origin evolved or developed particular senses which incline them to enjoy the umami flavor? In the eastern Himalayas green vegetable soybeans are also boiled and eaten.

Section 10.3, “Commercialization through ethnic food tourism,” suggests that just as tourists visit the vineyards of France, tempeh shops in Indonesia, and artisans or factories that make shoyu or sake in Japan, there are potential tourist sites for experiencing how traditional foods are made in the Himalayan villages. For kinema, try visiting Aho village in Sikkim.

About the author (p. xix): A good biography and portrait photo are given. In the “Acknowledgments” (p.

xvii) he writes: “I am thankful to my wife Dr. Namrata Thapa for constant support and technical assistance in the preparation of this book. Over the past 16 years the team of brilliant Ph.D. students that I have recruited from the Food Microbiology Laboratory, Sikkim Government College, Gangtok, has been the real driving force in researching and identifying the scientific mechanisms of ethnic Himalayan fermented foods.” He then lists their names. Address: Food Microbiology Lab., Sikkim Government College, Gangtok, Sikkim 737 102, India.

1911. Tamang, Jyoti Prakash; Kailasapathy, Kasipathy. eds. 2010. Fermented foods and beverages of the world. Boca Raton, Florida: CRC Press / Taylor & Francis. xii + 448 p. Illust. 25 cm. Series: Food science and technology.

• **Summary:** Includes a directory of “Contributors” (p. xi-xii). Among the many interesting, carefully researched and documented chapters, those that mention soy include: Chapter 1. “Dietary culture and antiquity of fermented foods and beverages,” by J.P. Tamang and D. Samuel (p. 1-40, for soy see the section titled “Fermented soybeans and non-soybean legumes,” p. 11).

Chapter 2. “Diversity of fermented foods,” by J.P. Tamang (p. 41-84, for soy see the section titled “Fermented soybeans and non-soybean legumes,” p. 50-52, plus p. 71).

Chapter 6. “Fermented legumes: soybean and non-soybean products,” by Toshirou Nagai and J.P. Tamang (p. 191-224, cited separately).

Chapter 7. “Fermented soybean pastes miso and shoyu with reference to aroma,” by Etsuko Sugawara (p. 225-45, cited separately).

Chapter 15. “Health aspects of fermented foods,” by Mariam Farhad, K. Kailasapathy, and J.P. Tamang (p. 391-414).

On page 282 is a section about viili, the Finnish fermented milk product, traditionally made in the summer as a way of preserving excess milk.

Table 12.4, “Some important vegetable foods of Africa” (p. 326) mentions dawadawa or iru, produced and consumed throughout most of West Africa, especially in the northern parts. It was traditionally made from the African locust bean (the seed of the leguminous tree *Parkia biglobosa*) but is now also widely made from soybeans. The bacterial fermentation is caused mainly by *Bacillus subtilis* and *Bacillus licheniformis*.

A flow sheet is given (p. 333) for the preparation of dawadawa / iru. A bibliography of the writings of the Nigerian microbiologist S.A. Odunfa appears on p. 348. Address: 1. Food Microbiology Lab., Sikkim Government College, Sikkim Univ., Gangtok, Sikkim, India; 2. School of Natural Sciences, Univ. of Western Sydney, Sydney, NSW, Australia.

1912. Tamang, Jyoti Prakash; Samuel, Delwen. 2010.



Dietary cultures and antiquity of fermented foods and beverages. In: Jyoti P. Tamang and K. Kailasapathy, eds. 2010. *Fermented Foods and Beverages of the World*. Boca Raton, Florida: CRC Press / Taylor & Francis. xii + 448 p. See p. 1-40. [188 ref]

• **Summary:** Contents: Cultural foods: Hindu foods, Buddhist foods, Christian foods, Muslim foods. World dietary culture: Use of hands, use of chopsticks, use of cutlery, evolution of dietary culture. Antiquity and cultural aspects: Fermented vegetables, fermented soybeans and non-soybean legumes, fermented cereals, fermented milks, fermented fish, fermented meats, fermented beverages and alcoholic drinks. Conclusion.

Section 1.3.2 titled “Fermented soybeans and non-soybean legumes,” begins with a concise and well documented paragraph on the origin of the domesticated soybean in the eastern half of north China around the 11th century BC around the end of the Shang dynasty (ca. 1700 to 1100 BC), then its dissemination / spread from this primary soybean gene pool to central and south China, and the Korean peninsula. The soybean then spread to Japan, and throughout Southeast Asia and into northern India during the following centuries.

The next paragraph discusses the two earliest Chinese fermented soyfoods: *chi* (*shi*) [fermented black soybeans] and *jiang* (*chiang*) [Chinese-style miso]. *Chi*, now known as *douchi* was “next to salt use in China.”

Note: Actually, salt was rarely used directly to season food in China; in the early days *jiang*, and later soy sauce had that honor. Yet salt was a major ingredient in both *jiang* and soy sauce.

Recipes for making 3 different types of *chi* and 14 different types of *jiang* are given in the *Qimin Yaoshu* (6th century B.C.). Soy sauce is presently an essential seasoning in Chinese cooking, “but it was not an ancient and deliberate preparation. It developed as a by-product of some *jiang* relishes and did not become of culinary importance until the Song dynasty (960-1279) (Sabban 1988).”

There follows a discussion of the early development of fermented soyfoods in Japan, including the Taiho Laws (AD 701) and the *Engishiki* (AD 906). Salted fermented black soybeans, which originated in China, took root in central Japan, where they were known by various names such as *hama-natto* and *daitokuji-natto*; in Taiwan they were known as *in-shi* (Yokotsuka 1991).

The subsequent few paragraphs contain three statements which we believe are incorrect and are not found in the sources cited: (1) “*Natto*, a fermented sticky soybean, was introduced to Japan from China by Buddhist priests during the Nara period around AD 710-794 (Ito et al. 1996, Kiuchi 2001 [p. 9]). Note: This statement is based on a misinterpretation of the documents cited and on the confusion resulting from the fact that the Japanese word “*natto*” can be used to refer to two very different foods, *natto*

and fermented black soybeans. Both documents are referring to the introduction to Japan (by a Buddhist priest) of salted, fermented black soybeans (*douchi*) and not of *itohiki* *natto*. For example, Kiuchi (2001, p. 9, written in English) states: “The two main varieties of *natto* [in Japanese] are *itohiki-natto* and *shiokara-natto*, which [referring only to the latter] was introduced to Japan from China during the Nara period (790-794) by a Buddhist priest.”

(2) “The production of shoyu and miso in China was recorded around 1000 BC, with the transfer of the indigenous knowledge to Japan happening at around AD 600 (Yokotsuka 1985). Yokotsuka is perhaps the world’s leading authority on this subject. However nowhere in this excellent chapter by Yokotsuka can we find anything that would justify the surprising statement above.

(3) “*Tempe* made in present day Indonesia was originally introduced by ethnic Chinese centuries ago.” No source is cited. Address: 1. Food Microbiology Lab., Sikkim Government College, Sikkim Univ., Gangtok, Sikkim, India; 2. Div. of Nutritional Sciences, Kings College London, London, United Kingdom.

1913. Tamang, Jyoti Prakash. 2010. Diversity of fermented foods. In: Jyoti P. Tamang and K. Kailasapathy, eds. 2010. *Fermented Foods and Beverages of the World*. Boca Raton, Florida: CRC Press / Taylor & Francis. xii + 448 p. See p. 41-40. [228 ref]

• **Summary:** In the section titled “Types of fermented foods” (p. 46-67) is a subsection on “Fermented soybeans and non-soybean legumes.” About 90% of fermented legumes are soybean-based foods while the rest are non-soy. Fermented soyfoods have long been made in Asia, especially by Chinese, Nepalis, Japanese, Thais, Koreans, Indonesians, and many minor ethnic groups. Consumption of ethnic fermented soyfoods “is not part of the traditional food culture of non-Mongoloid races.”

Table 2.2, “Some fermented legume products of the world,” has six columns: (1) Name of fermented food (alphabetical). (2) Substrate (e.g., soybean, Locust bean). (3) Sensory property and nature (e.g., alkaline, sticky, paste). (4) Culinary (e.g., side dish, condiment). (5) Microorganisms. (6) Country. Those having soybean as a substrate are aakhone, bekang, chee-fan, chiang [jiang], chungkokjang, douchi, doenjang, furu, hawaijar, kecap, ketjap, kinema, meitauza, meju, miso, natto, pepok, perayaan, sieng, shoyu, soy sauce, sufu, tauco, tempe, thua nao, tofu si? [China, Japan], and tungrymbai. Address: Food Microbiology Lab., Sikkim Government College, Sikkim Univ., Gangtok, Sikkim, India.

1914. Fujita, Y.; Iki, M.; Tamaki, J.; et al. 2011. Association between vitamin K intake from fermented soybeans, *natto*, and bone mineral density in elderly Japanese men: the Fujiwara-kyo Osteoporosis Risk in Men (FORMEN) study.

*Osteoporosis International*. March 11. [Epub ahead of print]. [38 ref. Eng]

• **Summary:** “A cross-sectional analysis of 1,662 community dwelling elderly Japanese men suggested that habitual natto intake was significantly associated with higher bone mineral density (BMD). When adjustment was made for undercarboxylated osteocalcin levels, this association was insignificant, showing the natto-bone association to be primarily mediated by vitamin K.”

“Conclusion: Habitual intake of natto was associated with a beneficial effect on bone health in elderly men, and this association is primarily due to vitamin K content of natto, although the lack of information on dietary nutrient intake, including vitamin K1 and K2, prevented us from further examining the association.” Address: Department of Public Health, Kinki University Faculty of Medicine, 377-2 Oono-higashi, Osaka-Sayama, Osaka, 589-8511, Japan.

1915. *SoyaScan Notes*. 2011. Updated USDA database on the isoflavone levels in foods, commercial ingredients, soybeans and soyfoods (Overview). April 23. Compiled by William Shurtleff of Soyinfo Center. [1 ref]

• **Summary:** The link is now [http://www.ars.usda.gov/SP2UserFiles/Place/12354500/Data/isoflav/Isoflav\\_R2.pdf](http://www.ars.usda.gov/SP2UserFiles/Place/12354500/Data/isoflav/Isoflav_R2.pdf). “Legumes and legume products” starts on p. 16. Start by going to page 24, which is where the soy section begins. Then you can do a PDF search for fermented soyfoods such as: Tempeh, miso, soy sauce, natto, or Sufu (fermented tofu)—and you will see that they are NOT lower in total (or specific isoflavones) than nonfermented soyfoods such as: Tofu, soymilk, soybeans (immature), soybeans (mature), etc.

1916. *Nichi Bei Weekly*. 2011. Northern California Soy & Tofu Festival: Come discover the joy of soy. June 2-8. p. 5-7. Cover story.

• **Summary:** This issue announces the first Northern California Soy & Tofu Festival to be held on June 11, in San Francisco Japantown, Peace Plaza, 11 am–4 pm. It is sponsored by the Nichi Bei Foundation and many large corporate sponsors. Gold sponsor: Pacific Gas and Electric Company. Silver sponsors: Kikkoman, Union Bank.

The main article on page 6 is titled “Soy to the world: Small businesses explore varied tastes, textures,” by Akiko Minaga (Nichi Bei Weekly Contributor). It discusses Megumi Natto, Hodo Soy Beanery, San Jose Tofu, and Sacramento Tofu.

A second article by her (on the same page) titled “Soy, the magic bean: The many benefits of soy” discusses tofu, soymilk, beauty treatments, soy clothing, soy ink, etc.

A sidebar is titled “Tofu: A brief 2,000 year history,” by William Shurtleff of Soyinfo Center.

Photos show: (1) Chester Nozaki and his wife, Amy, owners of San Jose Tofu. (2) Alvin and Dorothy Kunishi, owners of Sacramento Tofu. (3) Min Tsai, owner of Hodo

Soy Beanery. Address: P.O. Box 15693, San Francisco, California 94115. Phone: (415) 673-1009.

1917. Shurtleff, William. 2011. Comparison of the macrobiotic diet and Dr. Caldwell Esselstyn’s whole foods, plant-based diet (Editorial). *SoyaScan Notes*. July 2.

• **Summary:** Meat: The macrobiotic diet allows consumption of fish, shellfish, and other seafoods, whereas the Esselstyn diet (which is designed to prevent and reverse coronary artery disease / heart disease) allows no animal products.

Dairy: The Esselstyn diet prohibits consumption of dairy products; the macrobiotic diet discourages their consumption. Note: Actually nothing is prohibited by macrobiotics; as taught by George Ohsawa, it is broad, flexible, and nondogmatic.

Refined carbohydrates, such as white sugar, white rice, and white flour: Both diets discourage their use except that the Esselstyn diet uses white sugar in a small percentage of desserts. For example, in the book *Prevent and Reverse Heart Disease* (2007), the recipe for Birthday Cake (p. 276) calls for “1 cup (or less) sugar.” Chocolate Red Devil Cake (p. 278) calls for “1 cup sugar.” Luscious Lemon Cake (p. 280) calls for “3/4 cup (or less) brown sugar plus granulated sugar sprinkled over the cake.”

Salt: The salt content of macrobiotic diets (like the traditional Japanese diet) is high, provided by such condiments as miso, soy sauce (tamari), and gomashio, whereas the Esselstyn diet aims to use as little salt as possible—since many of the patients have cardiovascular disease and hypertension. “If you *still* miss salt, try adding a little Bragg Liquid Aminos” (a salt alternative) or small amounts of “South River Sweet White Miso or low-sodium tamari. Try to limit sodium consumption to 2,000 mg a day.” A table shows the amount of sodium in salt and four condiments (p. 122).

Soyfoods: Macrobiotic diets uses soyfoods abundantly; in addition to miso and tamari, they enjoy tempeh, natto, and small amounts of tofu. The Esselstyn diet advises: “Eat soy products cautiously. Many are highly processed and high in fat” (p. 121).

Fruits: Macrobiotic diets use fruits sparingly, since most are classified as very “yin.” However apples (the most yang fruit) are used quite freely. The Esselstyn diet encourages the use of all fresh, whole fruits except avocados (which are high in fat).

Grain vs. vegetables. Macrobiotic diets are based on the central idea of a primary food (such as brown rice or other whole grains) and secondary foods (such as vegetables). The Esselstyn diet encourages the use of all fresh, whole vegetables. One might say that the center of the Esselstyn diet is fresh fruits and vegetables.

Macrobiotic diets strongly discourages consumption of foods which are members of the nightshade family—potatoes, tomatoes, and eggplants. The Esselstyn diet encourages the

consumption of whole (unpeeled) potatoes and tomatoes.

Macrobiotic diets resembles a Japanese diet, whereas the Esselstyn diet resembles an American diet.

Use of local, seasonal foods: Macrobiotic diets emphasizes this somewhat more than the Esselstyn diet.

Use of added oil: The Esselstyn diet strongly discourages this, whereas macrobiotic diets focuses more on the quality of the oil, but while still advising moderation in quantity, includes recipes for deep-fried foods (such as tempura).

The term “macrobiotic diets” is short, whereas the term “whole-foods, plant based diet” is descriptive but too long, and in need of a shorter name. Address: Founder and owner, Soyfoods Center, Lafayette, California. Phone: 925-283-2991.

1918. Shurtleff, William; Aoyagi, Akiko. comps. 2011. *How Japanese and Japanese-Americans brought soyfoods to the United States and the Hawaiian Islands—A history (1851-2011): Extensively annotated bibliography and sourcebook.* Lafayette, California: Soyinfo Center. 328 p. Subject/geographical index. Printed 12 July 2011. 28 cm. [1259 ref]  
 • **Summary:** Begins with a chronology of how Japanese and Japanese-Americans brought soyfoods to the United States and the Hawaiian Islands. Contains 110 historical photos and illustrations (some in color), graphs, and tables. <http://www.soyinfocenter.com/books/146>. Address: Soyinfo Center, P.O. Box 234, Lafayette, California 94549. Phone: 925-283-2991.

1919. Omizu, Yohei; Tsukamoto, Chigen; Chettri, Rajen; Tamang, Jyoti Prakash. 2011. Determination of saponin content in raw soybean and fermented soybean foods of India. *J. of Scientific and Industrial Research* 70:533-38. July. [21 ref]

• **Summary:** “Saponin composition and contents in seeds of raw dried soybean and fermented foods of India (*kinema*, *bekang*, and *tungrymbai*) were investigated by liquid chromatography-tandem mass spectrometry analysis.” Address: 1-2. Food Chemistry Lab., Dep. of Biological Chemistry and Food Science, Faculty of Agriculture, Iwate Univ., Morioka, Iwate 020-8550, Japan; 3-4. Food Microbiology Lab., Sikkim Government College, Sikkim University, Tadong 737102, India.

1920. *SoyaScan Notes*. 2011. Chronology of Soyfoods Center’s summer intern and employment program, with photos (Overview). Nov. 29. Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** \* = Workers but not college summer interns.

1. 1984 Irene Yen \$4.50/hr. She called to ask if we had any job openings. We said “no,” having never considered the idea. After we met her and saw such a fine person and extraordinary talent, we changed our minds. She began work on June 21. Two color photos writing at desks in Aug.

1984. (a) Upstairs plywood desk with curtains drawn to show back hillside and 8 file-card boxes (each 5½ by 12 by 4 inches deep) filled with 3 by 5 inch lined white file cards. (b) In downstairs guest rooms editing chapters and checking bibliographic references in *History of Soybeans and Soyfoods* book. Later photo, Oct. 1990, cooking at stove in Atlanta, Georgia.

2. 1985 Tony Jenkins \$6.00 + incentives up to \$11.50. Two color photos: (a) Typing on keyboard with computer at Bill’s main desk; turning around to look at camera. (b) Standing with his younger brother at their home; Tony wearing a Stanford, brother wearing a Cal T-shirt.

3. 1985-86 Sarah Chang (fall & winter) \$5/hr. \*Claire Wickens, 1985-87, 1989. Color photos show: (a) 1990 June 21. Sitting at desk with electric typewriter in Office #2; file cabinets and scale in background. (b) 1991 April 19. With kids Tina and Tim Wickens; birthday cake on table. (c) 1991 April 26. Standing with Kazuko Aoyagi in kitchen of Shurtleff home, each holding a glass, with fridge and hallway bookshelf in background. (d) 1994 Dec. Black and white photo of Claire and husband Jim with backpacks in New Zealand. They backpacked around the world.

4. 1986 Laurie Wilmore \$5/hr.

5. 1987 Alice Whealey \$5/hr.

6. 1988 Simon Beaven \$6/hr. Two color photos. (a) Portrait photo in 1987 wearing tuxedo at Northgate High School in Walnut Creek. (b) 1993 Sept. 5 in living room in living room of Shurtleff home in Lafayette with Joey Shurtleff leaning on Simon’s knee and Matthew Rowley in foreground.

7. 1989 \*Elinor McCoy (Jan-April, \$12.00). \*Pat McKelvey (April 24, \$12.00).

8. 1990 Ron Perry \$9.50. Color photo of summer 1990 dressed in tuxedo.

9. 1991 Walter Lin \$9.50. One color photo of 16 Nov. 1989, dressed in v-neck sweater, white shirt and tie, leaning against tree. Two color photos of 30 Aug. 1991 showing Walter and Bill Shurtleff standing in front of white Dodge van in Soyfoods Center’s driveway.

10. 1992 \*Dana Scott Jan-July. Ron Perry, June (prep for NAL trip). Two color photos of June 1992 showing Bill and Ron Perry seated on bench in back yard of Soyfoods Center having lunch together, with wall and ivy-covered hill in background. \*Alex Lerman Oct. 1992.

11. 1993 Jeremy Longinotti.

12. 1994 John Edelen (May-Aug). Color portrait photo (1994) of John in coat and tie. Christmas photo of John’s parents, brothers and sister, and 2 grandparents. Page from 1994 California Water Polo brochure with photo and description of John—a great athlete.

13. 1995 John Edelen (Jan-Oct).

14. 1996 Lydia Lam \$9->\$10. \*Gretchen Muller.

15. 1997 Joyce Mao \$9->\$10. \*Luna Oxenberg \$9.50 (Oct. 1 to Dec. 31, Krishna). \*Joelle Bouchard.

16. 1998 Justine Lam. Hurdler. Freshman at Cal. Start May 26. \$9.50 -> \$12.00. Works 4 days/week, Mon. off. 9 to 4:30. 30 min lunch. She accomplished a lot and taught me a lot. Main project: Creating a keyword for each soybean variety (SBV) introduced before 1924, then designing a keyword check, running it, finding the earliest record containing that keyword, and filling in a form for each variety. We now have 109 SBV- keywords. The earliest is 1891. Justine is the first Soyfoods Center intern who looks first to the Internet/Web for the information she desires. She is very skilled at using it, and does some nice projects for SC at her home.

16A. Cheryl Ishida (mother), Christopher, and Catherine do volunteer work at Soyfoods Center and Cal Library from time to time. Two color photos (May 1998) show the three standing by trunk of liquid amber tree near Soyfoods Center driveway.

17. 1999 Justin Hildebrandt. Cal. Start June 1. \$10.50.

18. 2000 Michelle Chun. Start June 21. \$13.00. Worked 3 hours/week since Sept. 30, 1999. Excellent typist. Summer: Started June 1 at two days/week. From Aug. 1, after DVC class, 3 days, Tues., Wed., and Thurs.

19. 2000/09. Alison Fruman. Last day 2001 Jan. 18. Checking all books in SC bookshelves—only.

20. 2000/10. Olga Kochan. Campolinda. A wonderful person. Start Oct. 7. One day/week (Sun.) for 3 hours, 11-2:00. During summer 2001 works Sat. and Sun. 3 hours each. 2001 Jan. 1, rate increase to: \$10.50. 2001 Sept. 1. Rate increase to \$12.00. After 2001 Sept. 11 attack I am unable to find her replacement, so she very kindly continues on for 9 more months, until 26 May 2002, start of summer.

21. 2001/01. Michelle Leung. Takes Alison's place checking SC books.

22. 2001/05 Ryan Browne, Freshman at Harvard Univ. Works one day/week. Extremely talented and nice. \$12/hour. Earns most money teaching tennis each day. Mom is Lydia.

22a. 2001/09 to 2002/05. Olga Kochan—see above. Then from May 2002 to Aug. 2003 she helps SC greatly and generously to find early Russian-language documents and to translate them into English. Then she enters college as a freshman at U.C. Berkeley (Cal).

23. 2002/05. Loren Clive. Speaks good French. Works one day a week, 3 hours a day. Then first summer with no intern.

24. 2002/09. Marina Li. She called to volunteer the very day I was about to send out Help Wanted ads. Works one day a week. Last day 2003 May 23. Very creative, fine values. Has difficulty with computer work. For rest of 2003 helps from time to time with sorting, then have lunch together. Color photos: (a) On Mills College brochure (Oct. 2001) of Marina and 4 other students in Institute for Civic Leadership. (b) With Bill Shurtleff (April 2003), with Soyfoods Center in background. (c) With coworkers in Berkeley gardening project.

25. 2003/10. Loren Clive. One day a week for 7 hours/day. \$13/hour. First 90 min is clearing Bill's soy in-box. Rest of time is for entering records and abstracts from *Vegetarian Messenger*, Jan. 1887-March 1889.

26. Rowyn McDonald, a Stanford student. 2004 June 15 to Sept. 3. She was instrumental in our starting to publish books on the Web and in starting to learn Adobe PageMaker. She reformatted all the chapters in our History of Soybeans and Soyfoods book and sent them to Paul and Gail King, who put them on the Web. Her work this summer has been outstanding. She has an extraordinary intellect, is a fast learner, has excellent focus and concentration, is a fast typist, accomplishes a great deal each day, makes few mistakes, and has become very skilled at asking questions and receiving the answers in a selfless, clear way. She was a gift from God, the perfect match for the job. Also, I learned more from her about using computers (esp. the Web and WinWord) than I have from any other intern.

27. Casey Brodsky. 2007 Oct. 26 to 2008 June 6. Sophomore at Campolinda. Four main projects: (1) Make a record for every article in *Time* magazine that mentions tofu. I notice how *Time* has mostly negative things to say about this new, healthy food; protecting the status quo. (2) Add the exact date (to the nearest day) to thousands of records of various types. Upgrading the YR field is the main reason we changed a record number of BIBLIO records (22,159) this year. (3) Add info to the Abstract field for about an hour each Friday. (4) Complete the AD field for hundreds of letters in our library; e.g., "Typed, with signature on letterhead." She also found that many letters have been misplaced.

28. Hanna Woodman. 2008 June 17 to July 16. Sophomore at Acalanes. She is a fast and accurate typist, and likes typing projects, so (1) She typed in many abstracts and contents. (2) Completed the AD field for hundreds of letters in our library; e.g., "Typed, with signature on letterhead." She also found that many letters have been misplaced. (3) Entered every chapter with heads for the AOCS monograph on the soybean. (4) Added missing exact dates in the AD field. (5) Sorted documents in boxes for WRS to file. (6) Highlighted reference sheets in preparation for Bill's trips to Cal libraries.

29. Elizabeth Hawkins. 2008 July 22 to Aug. 21. Senior at Campolinda. Main projects—to enter: (1) Natto book bibliography by Hesseltine and Kato. (2) Lots of abstracts and quotations. (3) Soybean in Asia proceedings + A and B level heads. (4) All unentered articles from *Bluebook Update* (Golbitz). (5) Mian Riaz book on soy. (5) Oak Smith's letters. When I am gone she always works on my computer.

30. Michelle So. 2008 Oct. 9.

31. Talat Mirmalek 2009 Jan/Feb. Sorting. "Talat" in Farsi means "rays of the sun." Being a young Muslim lady, she was not allowed to work here unless her sister (Taliah) or father were in the same room with her.

32. Molly Howland. 2009 June 15 to July 31. Senior at

Campo.

33. Jacqueline Tao. 2009 Aug. 3-25. Biosciences. Then Sept. 10 to Oct. 14. Boudewijn Aasman 2009 Oct. 28 to 30 Dec. Unfit for the job.

33. Jacqueline Tao. 2010 Jan. 21 to June 10.

34. Jessie Kathan 2010 June 14-Aug. 24. Biosciences libe. Campo.

33. Jacqueline Tao. 2011 Jan. 2 to June 3.

35. Lynn Hsu, 2011 June 11 to July 20.

33. Jacqueline Tao. 2011 Sept. 9-15.

34. Brooke Vittimberga 2012 Feb. 19.

1921. Iso, Miyuki. 2011. Ohisama nattô, tamago de genki [Ohisama natto with eggs will make you healthy (Photograph)]. Tokyo: Doshinsha. 27 x 39 cm. [Jap]\*

• **Summary:** A color photograph for children. Ohisama is a children's word meaning "Honorable Mr. Sun" and probably part of the name of a natto product. This photograph may well be an advertisement.

1922. Kanda, Sumiko; Ohshima, Taeko. 2011. Yûrei nattô [Ghost natto]. Tokyo: Arisukan. Unpaginated. 24 cm. [Jap]

• **Summary:** For a juvenile audience.

1923. Koshihara, Haruka; Yugi, Satomi. 2011. Bijin o tsukuru hakkôshoku reshipi: shikôji, amazake, yooguruto, nattô. kantan oishii karada ni yokute kirei ni nareru [Fermented food recipes to make you beautiful: shio-koji, amazake, yogurt, natto. Simple, delicious and good for your body; you'll become pretty]. Tokyo: Jakometei Shuppan. 87 p. 21 cm. [Jap]\*

1924. Koshimizu, Masami. 2011. Kôji, miso, nattô, tenpe, amazake [Koji, miso, natto, tempeh, amazake]. Tokyo: Nosangyoson Bunkakyokai. 138 p. 21 cm. Internet resource. [Jap]\*

• **Summary:** Note that all are Japanese fermented foods; miso, natto, and tempeh are fermented soyfoods.

1925. Mohr, Jürgen. 2011. Stop für Osteoporose und Herztod: das vergessene Vitamin MK-7; das neu entdeckte Naturwunder MK-7 aus Natto reinigt Ihre Arterien und stärkt gleichzeitig Ihre Knochen!; die krisenfeste Lebensversicherung für ein gesundes und vitales Leben [Stop osteoporosis and heart disease: the forgotten vitamin MK-7; the newly discovered natural wonder MK-7 from natto cleans your arteries and at the same time strengthens your bones; the stable life-insurance for a healthy and vital life]. Kerkade, Netherlands: Food for Health. 63 p. 22 cm. [Ger]\*

• **Summary:** Note: Kerkrade is a divided city, between the Netherlands and Germany.

1926. Vos, Heidemarie. 2011. Passions of a foodie:

An international kitchen companion, A to Z. Durham, Connecticut: Eloquent Books. An imprint of Strategic Book Group. 598 p. 26 cm.

• **Summary:** Best-selling author Heidemarie Vos recounts a fascinating story and her journey of putting together the world's first cross-referenced book regarding food-using more than five languages. This cookbook [which contains no recipes] will become an invaluable resource for your kitchen (from the publisher).

The Introduction states: "There are 7922 entries, 300,017 words... based on my own travels to 6 continents and over 40 countries." Note: This somewhere between a dictionary (in 5+ languages) or brief encyclopedia of food names. It immediately sets the language and cultural context for each word, and ends with broader or narrower terms. For example: "Aburage: Japanese cooking = A fried bean curd... Also see Bean Curd." It contains more than its share of errors and outdated terminology and spellings. It is a "print on demand" book.

It includes: Aburage. Adzuki beans [sic], Agé. Aji Nomoto [sic], see monosodium glutamate. Aka miso-red bean paste. See Miso. Almond milk. Almond oil. Arachide / Arachis. See Peanut. Arachide oil. See Peanut oil. Bean cake, fermented: Chinese cooking, "fu yu" [fermented tofu]. Bean curd, pickled: Chinese cooking. [What is it?]. Bean curd cheese, red: Chinese cooking, "nam yu" or "nan yu" [red fermented tofu]. Bean curd: Oriental cooking. Known as "tofu" in Japanese or "dow fu" in Chinese. Pressed bean curd is "dow fu kon" [doufu-gan, pressed tofu].

"Bean curd, dried [yuba]: Chinese cooking = Known as 'tiem jook' [sweet yuba] / 'fu jook pei', other dialects are 't'ien ch'u' and 'fu pi chi'. It is soybean milk residue, which comes in a thin rectangular sheet or is curled into round sticks. They are usually tan- or cream-coloured with a shiny, glossy smooth texture."

Bean paste, red: Chinese cooking. "Made from soybeans and sugar mashed together then fried and dried out until it resembles sand." Used to fill Chinese moon cakes. Bean sauce, Chinese: Chinese and Asian cookery. Many types including "min see jiong" or "do bahn jiang." Incl. "Black bean sauce." Beans, black: Chinese cooking. "A pulse [sic] known as 'wu dow' / 'wu do' [Black soybeans].

"Beans, black salted fermented: Chinese cooking = Known as 'dow si / dou shih,' used as a vegetable or spice. Known as 'wu dow' dried and salted. They are dull, wrinkled, moist and tender and have an appetising fragrance, yet are pungent with a tangy salty flavor. Used as a flavor enhancer in dark sauces." Keep covered so they do not dry out... "Must be rinsed prior to use to avoid over-salting. Store in a closed jar in the refrigerator after opening."

Bean sprouts: Asian cooking [small green are mung bean sprouts, large yellow soybean sprouts]. Benne seeds: Sesame seeds are used to make sesame oil and tahini (sesame paste). Black beans, Chinese. Also known as 'salted black

beans' or 'fermented black beans' and as 'dow si' (Chinese).  
 China beans: See Soya / soy bean. Earth nut: See Peanut.  
 Edamame: Japanese cooking. "Fresh soybean in or out of the pod."  
 Firm tofu. Fried tofu puffs. Ground nut: See peanut.  
 Hard tofu. Hydrogenated fats. See fats. Miso. Naahm yu:  
 Chinese term. "A cheesy-looking bright red bean curd sauce"  
 [Red fermented tofu]. Nam yu / Nan yu: See Bean curd  
 cheese, red. Shoyu: Japanese cooking. Japanese soy sauce.  
 Soy bean / Soya bean. *Glycine soja*, also known as "China  
 beans," 'Butter Beans' and 'Haricot de Java' (French)." Soy  
 bean jam / condiment. See Main see. Silken tofu. Silken firm  
 tofu. Soya oil. Soya sauce. Soy sauce. Tamari soy sauce.  
 Tofu. Tofu tempeh [sic].

Not listed: Amazake. Lecithin. Daitokuji natto.  
 Fermented black beans. Hamanatto. Kudzu. Kuzu.  
 Meat alternatives. Meat substitutes. Milk alternatives or  
 substitutes. Milk, nondairy. Milk, soy. Natto. Seitan. Soy  
 milk. Soy protein concentrate. Soy protein isolate. Soy  
 protein, textured. Tempeh. Teriyaki sauce. Yuba.

Errors: Arame is not also known as "Hijiki." Address:  
 Port Elizabeth, South Africa.

1927. Barber, Linda. 2012. Re: Work with tofu and natto in  
 Japan. Letter (e-mail) to William Shurtleff at Soyinfo Center,  
 Jan. 9. 3 p.

• **Summary:** Introduction: Linda Barber Pike was born and  
 raised in Milwaukee, Wisconsin. She graduated from the  
 University of Wisconsin-Stout with a bachelor of science  
 degree in Home Economics Education, specializing in urban  
 education (1971). After teaching for 6 years in Milwaukee,  
 she accepted a position at Kobe College teaching Oral  
 English and Home Management. It was during this time that  
 she became interested in Japanese cuisine and indigenous  
 foods, especially tofu, and natto. After returning to the  
 United States in 1982, Ms Pike earned a Master of Science  
 degree in Vocational Education from the University of  
 Wisconsin-stout. Her thesis, "Development, presentation,  
 and evaluation of an instruction package on tofu for high  
 school students" provided a model for introducing tofu to  
 teenagers in a family consumer class setting.

Linda started a family with Marvin Pike in 1985 and  
 moved to Indianapolis, Indiana. She returned to teaching  
 in 1991 as a preschool teacher where her son, Dallis, was  
 attending. In 1996 she accepted a position at Carmel High  
 School, Carmel, Indiana in the Family and Consumer  
 Science Department. She enjoyed teaching Foods and  
 Nutrition, Foreign Foods, Child Development, and directed  
 the on-site preschool that offered high school seniors the  
 opportunity to teach 3 and 4 year olds. From 2005-07,  
 Linda also enjoyed being an adjunct instructor for Ivy Tech  
 Community College, Indianapolis, teaching child care  
 licensure classes. Ms. Pike retired from all teaching in 2010,  
 except for mentoring Dallis while he is earning a PhD in  
 educational studies. Linda still enjoys reading books on tofu,

sampling soy foods at Trader Joes, and serving her friends  
 healthy snacks that contain tofu hidden in some form.

For most foreigners living in Japan, an English-Japanese  
 dictionary was the most used book and carried everywhere.  
 For me, it was *The Book of Tofu*. It wasn't long after I arrived  
 in Kobe in 1977 to teach home management skills to the  
 young women of Kobe College, that I discovered tofu. A low  
 teacher's salary, and lack of western food stuff prompted me  
 to shop in neighborhood markets. Tofu was always there.  
 And it was always cheap. But, I had no idea how to prepare  
 it. I needed a book in English that would help me use this  
 food stuff.

Lucky for me, I discovered *The Book of Tofu*. I was  
 drawn to the illustrations and recipes that used just a few  
 ingredients. But what really sold me was the recipe for Tofu  
 Ice Cream. A Wisconsin girl had to have her ice cream, but in  
 Japan, it was expensive and not readily available.

My Japanese students and friends were amazed when I  
 put tofu in a blender and added sugar and cocoa. They were  
 amazed when I pulled it out of the freezer and scooped it into  
 bowls. They were delighted with the taste. For me, it was the  
 beginning of a soy food journey that continues to this day.

My students and I had faculty teas with tofu cookies,  
 cheesecake and quiche. Soon these parties became news and  
 I was asked to do short cooking segments at various T.V.  
 networks. Making western-style recipes from a Japanese  
 food such as tofu or natto was considered an oddity. I  
 traveled all over Japan making T.V. appearances. For a tofu  
 and natto company I developed recipes for their products  
 and starred in their commercials to promote these products.  
 I designed food layouts and recipes for their company's  
 brochure. Various printed media companies were also  
 expressing interest in recipes and ideas that used tofu and  
 natto in western ways. I began giving magazine interviews  
 about western ways to use Japanese soy foods. It was after  
 I learned how to make tofu in my kitchen, that the Kobe  
 YWCA asked that I teach classes to their Japanese members.  
 My adult Japanese students did not know how to do this,  
 as they purchased their tofu from supermarkets and small  
 markets, much like Americans would buy bread from the  
 grocery store and not know how to make bread from scratch.

I had fun creating western style recipes for tofu and  
 natto and found it easy because of my background in food  
 science. I simply used tofu in recipes where a protein like  
 eggs was included. Because natto tasted like aged Wisconsin  
 cheese to me, I included natto in dishes that used cheddar.  
 One of my last projects included co-authoring a cook book,  
*The Tofu Gourmet* (in English), published in Japan. It is still  
 available all over the world.

Besides recipes, *The Book of Tofu* became a travel guide  
 for me. I wanted to visit the places, restaurants, and shops  
 that were highlighted in the book. Mentioning *The Book of  
 Tofu* and its author, Bill Shurtleff, I was welcomed in these  
 shops and allowed to photograph how the foods were made.

When asked to develop recipes for a company, I asked for a tour of the company and documented the manufacturing process. The photos of the natto factory are examples of such a tour.

I enjoyed meeting other Americans who were discovering the joys of tofu and natto. During one of these visits, Richard Leviton from Soy food magazine asked me to write an article for the journal. *Natto: The Taste of Japan* was written and printed in 1982. Natto was everywhere in Japan, but because of its unusual texture was not liked by many Westerners. There was a lack of ideas on how to use it in recipes that might appeal to Americans. The article was my attempt to inspire Americans to incorporate natto in their meals.

I learned about the tofu making process by working alongside a tofu master in a small neighborhood tofu shop in Kyoto. This experience was arranged by the soy food trade newspaper, *Toyo Shinpo*. During my short apprenticeship I was intrigued by the meditative experience of making tofu. I carried that feeling of being present in my daily chores. Washing dishes were never the same for me. Seeing the craftsman's tools, many handed down from father to son, were honored and cared for. Today, my mother's well worn wooden spoon looks different to me. It is not just an old spoon, but something that holds a family spirit and it imparts that spirit into everything I stir.

I left Japan in 1982 to go back to school. I wrote my master's thesis on introducing tofu to high school students. Tofu ice cream and tofu spice cookies were the first ways my students experienced tofu.

When I taught preschool in the 1990s, I put my tofu making tools in the home making center, and served tofu carrot cake at snack time. The little ones learned how to say "Ohayo" [Ohayô = "Good morning" in Japanese] and how to use chopsticks. They folded origami, and made fish kites. They dressed up in mama-san aprons and walked in tabi socks.

I returned to the high school classroom, this time in Carmel, Indiana, to teach foods classes. It was fun to expose young people to new tastes, culture and soy foods. For a special experience, the Japanese language teacher and I divided our classes. She taught my cooking class some Japanese phrases, and I taught her students how to prepare something with tofu.

The "way of tofu" changed my life, career, and my student's lives. Tofu not only nourished my body, but it nourished my spirit and experiences. And yes, *The Book of Tofu* is still on my bookshelf, complete with scribbles, and stains, right next to the not so worn English-Japanese dictionary. Address: 10868 North Cornell St., Indianapolis, Indiana 46280.

1928. Herz, Rachel. 2012. You eat that? Disgust is one of our basic emotions—the only one we have to learn—and nothing

triggers it more reliably than the strange food of others. *Wall Street Journal*. Jan. 21. p. C3.

• **Summary:** This interesting article begins: "Nattô is a stringy, sticky, slimy, chunky fermented soybean dish that Japanese regularly eat for breakfast. It can be eaten straight up, but it is usually served cold over rice and seasoned with soy sauce, mustard, or wasabi."

For Westerners, nattô suffers from its alien smell and odor; it "smells like the marriage of ammonia and a tire fire... I've never met a Westerner who can take a bite of nattô on the first attempt. What Japanese love, we find disgusting."

A color photo shows natto on chopsticks being lifted out of a bowl partly filled with nattô; stretchy strings connect the upper nattô to the lower nattô. Address: Teacher and author, Brown Univ. [Providence, Rhode Island].

1929. Deutsch, Jonathan; Murakhver, Natalya. 2012. They eat that? A cultural encyclopedia of weird and exotic food from around the world. Santa Barbara, California: ABC-CLIO, LLC. 220 p.

• **Summary:** The first entry under the letter "N" is "Natto. Natto is a traditional Japanese food." "Bacterial fermentation yields its strong earthy aroma, often compared to ripe cheese, rotten mushrooms, or body odor, and mucilaginous texture (*neba-neba* in Japanese), the combination of which makes natto an acquired taste for many."

"Natto's strong odor and status as an everyday breakfast food in some parts of Japan give it important iconic status. For foreigners living in or visiting Japan, enjoying natto is considered a sign of Japanese acculturation, of having made the transition from visitor to resident."

1930. Ishitsuka, Makoto. 2012. Ibaraki-ken nazotoki sanpo: nattô, ankô, nabe kara antoraa, su kômon sama made hitachinokkuni niwa ima mo mukashi mo miryoku ga ippai Ibaraki ni itte mippe [A walk through mysterious Ibaraki prefecture: natto...]. Tokyo: Shinjin-butsumo. 287 p. 15 cm. Internet resource. Series: Shinjinbutsumo I-8-1. [Jap]\*

• **Summary:** Mito, the capital of Ibaraki prefecture, located just north of Tokyo, is famous for its small-seeded soybeans, long preferred by manufacturers of natto.

1931. Spots: Natto. See front of book.

1932. *SoyaScan Notes*. 2012. Soyfoods historical research and writing wish list (Overview). Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** 1. Early history of Chinese soyfoods companies and products in America and Europe. Especially Chinese tofu manufacturers in San Francisco and Los Angeles from 1850 to 1910.

2. Statistics on soyfoods in China during the 1980s.

3. The Swedish trading mission in Canton during the

1700s and 1800s and its work with soy sauce.

4. A lengthy, scholarly history (with an extensive bibliography) of soybeans and soyfoods in China written by a Chinese.

5. A lengthy, scholarly history (with an extensive bibliography) of soybeans and soyfoods in Japan written by a Japanese.

6. A lengthy, scholarly history (with an extensive bibliography) of soybeans and soyfoods in Korea written by a Korean.

7. A history of the health foods industry in America, 1930-1980.

8. A book on mochi or how mochi came to the West, with a clear chronology of commercial mochi manufacturers in the western world.

9. A scholarly history (with an extensive bibliography) of each of the following soyfoods in Japan, written by a Japanese with a long-term involvement in the field: natto, miso, shoyu, tofu.

10. Explain why Linnaeus stated in *Hortus Cliffortianus* (1737, p. 499) that the soy bean was grown in the colony of Virginia in North America.

11. A lengthy, scholarly history (with a good bibliography) of Chinese growing and processing soybeans in California. They must have grown them between 1849 and 1899! (13 Sept. 1991)

12. Visit the best libraries and centers in Germany for doing research on soybeans and soyfoods (See #37465) and try to get missing old documents.

13. Try to document the statement that the soybean was used as a coffee substitute during the Civil War in the USA (1861-1865).

14. Use the Coker family archives in South Carolina to write a history of the company's pioneering work with the soybean.

15. A history of early experimental gardens such as those that the Portuguese developed on the Cape Verde Islands, the British at Kew, Nairobi, Singapore, and the colony of Georgia (the Trustees' Garden of Georgia, a government experimental farm at Savannah, laid out in 1733), the Spanish (under Cortez / Cortés) in today's Mexico, etc. Did soybeans appear in any of them? When did they first appear in each?

16. Learn much more about Korean natto. Did it exist in Korea before Korea became a Japanese colony? Try to find some references, as in early studies of food in Korea. How widely was it made and used? Try to find some estimates of annual production. How was it served? What was its distribution in Korea in 1900? 1950? 2000?

17. A scholarly biography of Clifford E. Clinton of Los Angeles.

1933. *SoyaScan Questions*.2012. Questions about nattokinase. Compiled by William Shurtleff of Soyinfo

Center.

• **Summary:** 1. Do the natto enzymes retain their activity after passing through the hydrochloric acid activity of the stomach? Why do we read the following concerning another enzyme sold by supplement companies, serrapeptase? "When consumed in unprotected tablets or capsules, the enzyme is destroyed by acid in the stomach. However, enterically-coated tablets enable the enzyme to pass through the stomach unchanged, and be absorbed in the intestine." Yet nattokinase is not sold in enterically-coated tablets! Why?

2. Companies that sell supplements claim that nattokinase is fibrinolytic, and that any enzyme which is fibrinolytic is also anti-inflammatory. What proof do we have of the latter? 3. Such supplement companies say that nattokinase + serrapeptase is a powerful combination that "bullet-proofs you against heart disease and stroke." What proof do we have of this?

1934. *SoyaScan Questions*.2012. Questions about the history of tempeh in Japan. Further research needed. Compiled by William Shurtleff of Soyinfo Center.

• **Summary:** 1. When was *Taiwan Sotokufu Chuo Kenkuyujo* founded? 2. When did NAKAZAWA Ryoji start to work at the Taiwan lab? When did he finally leave for Japan?

3. In what year did NAKANO Masahiro start to work at the Taiwan lab? 4. In Nakazawa's *Hakko Bunken-shu* (11 volumes, 1950-65), is there any reference to tempeh under *Penicillium*? There is NOT any reference under *Rhizopus*.

5. Was any research on using defatted soybean meal (*dashi daizu*) to make tempeh done in Japan after World War II? (Dr. Nakano does not remember any). 6. Did Ohta or Karauchi write a very early article on tempeh in about Showa 7 or 8? (1932-33)? Ohta mentioned this.

7. Get a citation for Ohta's article on tempeh in *Nihon Jozo Kyokai Zasshi* from about 1980-81. 8. Try to get the early article (1947-48) from *Nosan Seizo*, written by Ohta or Nakano.

9. What were the main reasons that the Natto Association started to take a serious interest in tempeh in about 1981-82? When did this interest start? What people were most actively involved at the beginning? 10. What is the substrate used for growing tempeh spores at NFRI? Rice? Bread? Potatoes? Potato starch?

11. Is there a tie between Kalki's research on lactic acid and production of B-12 in tempeh? 12. When did the *Natto Gyokai News* publish its first article on tempeh? I'd like to get any other important articles it has published, as about the June 1983 trip to Indonesia.

13. Who is Mr. Kikuchi, at natto meeting, in charge of making tempeh spores? 14. How many pages does Nakazawa have on *Rhizopus*? Does he mention tempeh at *Penicillium*?

15. Who wrote the early article on tempeh at Kyushu University that interested Torigoe? 16. Did Ohta or Karauchi write an early article on tempeh in about Showa 7 or 8



(1932-33)? Ohta mentioned this.

17. Try to get the article (about 1947-48) from *Nosan Seizo*, written by Ohta Teruo or Nakano Masahiro. 18. When did the *Natto Gyokai News* (or any natto newspaper) publish its first article on tempeh? I'd like to get copies of all early and recent important articles it has published.

20. Who made the early tempeh starter in Japan? 22. When did Takashin start to make tempeh? How many kilograms do they now make per week?

An asterisk (\*) at the end of the record means that SOYFOODS CENTER does not own that document.

A plus after eng (eng+) means that SOYFOODS CENTER has done a partial or complete translation into English of that document.

An asterisk in a listing of number of references [23\* ref] means that most of these references are not about soybeans or soyfoods.

SOYINFO CENTER

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Azuki Bean. *Vigna angularis* (Willd.) Ohwi & H. Ohashi. Also called Adzuki, Aduki, Adsuki, Adzinki, Red Bean, Chinese Red Bean, Red Mung Bean, Small Red Bean. Japanese–Kintoki, Komame, Shōzu. Chinese–Xiaodou, Chixiaodou, Hsiao Tou [Small Bean], Ch'ih Hsiao Tou [Red Small Bean]. Former scientific names: *Phaseolus radiatus* (L.), *Dolichos angularis* (Willd.), *Phaseolus angularis* (Willd.) Wight, or *Azuki angularis* (Willd.) Ohwi. 3, 7, 13, 22, 25, 26, 28, 30, 39, 65, 98, 148, 152, 180, 189, 192, 239, 284, 402, 443, 460, 509, 552, 561, 576, 591, 595, 619, 695, 765, 790, 804, 808, 830, 850, 886, 925, 941, 986, 1003, 1006, 1071, 1085, 1134, 1142, 1153, 1168, 1193, 1297, 1382, 1398, 1432, 1470, 1526, 1532, 1534, 1538, 1562, 1637, 1641, 1646, 1659, 1660, 1745, 1837, 1864

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Kinema (Whole Soybeans Fermented with *Bacillus subtilis* strains from Eastern Nepal, Darjeeling Hills, Sikkim, and South Bhutan). Occasionally spelled Kenima. Close relatives are from Northeast India are: *Aakhone*, *Akhoni*, *Akhuni* (Nagaland), *Bekang* (Mizoram), *Hawaijar* (Manipur), *Peruyyan* (Arunachal Pradesh), *Tungrymbai* (Meghalaya). 70, 74, 522, 553, 602, 691, 755, 812, 822, 857, 901, 905, 906, 907, 911, 933, 934, 951, 957, 1024, 1028, 1049, 1053, 1083, 1086, 1087, 1092, 1100, 1125, 1136, 1148, 1165, 1169, 1171, 1172, 1180, 1181, 1187, 1197, 1198, 1199, 1202, 1239, 1240, 1242, 1243, 1245, 1267, 1278, 1313, 1404, 1433, 1442, 1443, 1452, 1474, 1481, 1483, 1484, 1485, 1496, 1515, 1528, 1529, 1530, 1535, 1541, 1542, 1547, 1560, 1564, 1574, 1575, 1581, 1595, 1596, 1613, 1618, 1620, 1621, 1626, 1627, 1631, 1665, 1673, 1683, 1696, 1715, 1719, 1720, 1731, 1736, 1738, 1748, 1759, 1764, 1769, 1792, 1794, 1810, 1811, 1812, 1813, 1820, 1823, 1834, 1835, 1852, 1853, 1854, 1857, 1859, 1860, 1863, 1882, 1886, 1887, 1888, 1889, 1907, 1910, 1911, 1919

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- Koji, Red Rice. (Also Called Fermented Red Rice, Ang-Kak / Angkak, Hongzao or Hong Qu / Hongqu in Chinese / Pinyin, Hung Ch'ü in Chinese / Wade-Giles, or Beni-Koji in Japanese). Made with the Mold *Monascus purpureus* Went, and Used as a Natural Red Coloring Agent (as with Fermented Tofu). 191, 484, 523, 767, 935, 940, 960, 1012, 1202, 1311, 1443, 1563, 1696
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- Myths of soybean history–debunking / dispelling. *See* History of the Soybean–Myths and Early Errors Concerning Its History
- Nasoya Foods, Inc. (Leominster, Massachusetts). Subsidiary of Vitasoy Since Aug. 1990. 905, 974, 1082, 1587, 1608
- National Agricultural Library (USDA, NAL, Beltsville, Maryland). 1915
- National Center for Agricultural Utilization Research (NCAUR) (USDA-ARS) (Peoria, Illinois). Named Northern Regional Research Laboratory prior to July 1976. Named Northern Regional Research Center prior to 28 Dec. 1991. 350, 351, 395, 396, 408, 448, 484, 517, 536, 542, 543, 549, 559, 572, 596, 606, 617, 632, 666, 698, 769, 772, 782, 787, 806, 819, 821, 824, 853, 868, 869, 878, 935, 940, 959, 974, 979, 987, 1001, 1007, 1011, 1012, 1020, 1030, 1032, 1098, 1190, 1191, 1192, 1201, 1202, 1278, 1291, 1313, 1323, 1410, 1446
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- National Nutritional Foods Association (NNFA). *See* Health Foods Industry–Trade Associations–National Nutritional Foods Association (NNFA)
- National Oilseed Processors Assoc. (NOPA) (National Soybean Oil Manufacturers Association from May 1930 to 1935; National Soybean Processors Assoc. [NSPA] from June 1936 to Aug. 1989. Washington, DC. Including Soy Flour Assoc. [1936-1949], Soya Food Research Council [1936], and Soybean Nutritional Research Council [1937]). 617, 1322
- Natto (Whole Soybeans Fermented with *Bacillus natto*). 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981,

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Thompsons Limited. Before Jan. 2004 named Thompson (W.G.) & Sons Limited, Blenheim, Ontario, Canada. Before 1963 W.G. Thompson. Founded in 1924 by Wesley G. “Tommy” Thompson. 1324, 1527, 1640

Thua-nao / Tua Nao (Whole Fermented Soybeans From Thailand).

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Thyroid function. *See* Goitrogens and Thyroid Function

Tillage practices. *See* Soybean Cultural Practices—No Till Farming

Timeline. *See* Chronology / Timeline

Tocopherols. *See* Vitamins E (Tocopherols)

Tofu (Also Called Soybean Curd or Bean Curd until about 1975-1985). *See also* Tofu—Fermented, Soy Ice Creams, Soy Yogurts, and Cheesecake, Which Often Use Tofu as a Major Ingredient. 3, 5, 7, 10, 11, 13, 17, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 37, 41, 43, 44, 45, 46, 48, 49, 50, 52, 53, 54, 57, 58, 59, 60, 61, 67, 69, 71, 73, 77, 79, 80, 81, 82, 83, 86, 87, 89, 90, 91, 92, 94, 95, 96, 97, 98, 102, 108, 109, 111, 112, 114, 115, 116, 117, 119, 120, 122, 123, 124, 125, 126, 127, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 141, 143, 145, 147, 148, 149, 150, 152, 154, 155, 162, 163, 166, 173, 178, 180, 181, 182, 183, 184, 187, 192, 195, 197, 200, 201, 204, 210, 215, 216, 217, 218, 221, 222, 230, 239, 240, 243, 244, 250, 251, 252, 254, 255, 256, 258, 259, 260, 262, 263, 266, 268, 282, 284, 293, 300, 301, 311, 321, 322, 328, 334, 349, 350, 359, 362, 370, 373, 374, 382, 383, 388, 389, 395, 396, 400, 401, 402, 406, 407, 408, 409, 410, 428, 431, 443, 444, 445, 448, 453, 454, 459, 460, 467, 468, 469, 473, 478, 479, 481, 482, 485, 488, 489, 490, 491, 492, 493, 498, 499, 501, 502, 507, 508, 509, 512, 513, 514, 515, 518, 527, 528, 534, 539, 540, 542, 549, 551, 552, 553, 556, 557, 562, 563, 573, 576, 577, 587, 588, 591, 594, 595, 597, 601, 603, 605, 606, 607, 610, 611, 612, 613, 617, 618, 619, 623, 625, 626, 634, 644, 649, 650, 652, 653, 660, 661, 672, 673, 677, 678, 680, 682, 693, 694, 695, 697, 698, 699, 703, 705, 706, 716, 733, 736, 737, 738, 739, 740, 741, 744, 746, 748, 749, 754, 755, 768, 769, 772, 775, 777, 778, 779, 781, 782, 786, 790, 793, 794, 804, 808, 809, 810, 811, 815, 817, 821, 825, 829, 830, 831, 833, 845, 846, 848, 849, 852, 854, 858, 859, 860, 861, 866, 867, 869, 878, 879, 884, 885, 886, 889, 891, 892, 894, 896, 898, 901, 902, 903, 904, 905, 906, 911, 912, 914, 916, 917, 920, 925, 931, 932, 933, 941, 942, 943, 944, 947, 948, 949, 950, 956, 957, 959, 961, 967, 970, 972, 973, 975, 977, 980, 986, 989, 999, 1000, 1002, 1003, 1005, 1006, 1007, 1011, 1012, 1013, 1016, 1017, 1019, 1020, 1023, 1027, 1028, 1035, 1040, 1041, 1044, 1046, 1047, 1051, 1062, 1063, 1064, 1066, 1068, 1071, 1072, 1076, 1078, 1080, 1082, 1085, 1093, 1095, 1096, 1097, 1104, 1110, 1118, 1119, 1121, 1122, 1124, 1125, 1126, 1127, 1129, 1135, 1139, 1140, 1142, 1152, 1153, 1154, 1155, 1159, 1160, 1161, 1162, 1168, 1183, 1188, 1189, 1193, 1205, 1206, 1208, 1215, 1216, 1218, 1222, 1226, 1228, 1231, 1244, 1245, 1253, 1254, 1255, 1258, 1265, 1269, 1270, 1271, 1277, 1279, 1283, 1285, 1292, 1293, 1296, 1298, 1300, 1301, 1302, 1303, 1305, 1318, 1322, 1324, 1334, 1336, 1340, 1343, 1344, 1349, 1360, 1365, 1372, 1377, 1380, 1381, 1382, 1384, 1389, 1390, 1398, 1399, 1402, 1403, 1408, 1409, 1410, 1411, 1412, 1416, 1417, 1427, 1428, 1431, 1432, 1434, 1438, 1442, 1445, 1448, 1452, 1454, 1456, 1459, 1460, 1461, 1462, 1466, 1470, 1476, 1479, 1489, 1490, 1492, 1493, 1494, 1495, 1497, 1498, 1499, 1500, 1501, 1502, 1504, 1505, 1506, 1508, 1510,

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Tofu companies (USA). *See* Azumaya, Inc. (San Francisco, California), Global Protein Foods (Valley Cottage, New York). And Parent Company, Kyoto Tanpaku K.K. of Kyoto, Japan, House Foods America Corporation (Los Angeles, California), Island Spring, Inc. (Vashon, Washington), Legume, Inc. (Fairfield, New Jersey), Morinaga Nutritional Foods, Inc., and Morinaga Nyūgyō (Torrance, California, and Tokyo, Japan), Nasoya Foods, Inc. (Leominster, Massachusetts). Subsidiary of Vitasoy, Northern Soy, Inc. (Rochester, New York), Ota Tofu Co. (Portland, Oregon. Founded in 1911), Quong Hop & Co. (South San Francisco, California), Tomsun Foods, Inc. (Greenfield, Massachusetts; Port

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## Yellow

Winged Bean (*Psophocarpus tetragonolobus*) (Also Called Four-Angled Bean, Goa Bean, Goabean, Asparagus Bean, Asparagus Pea, Segidilla, Seguidilla or Seguidillas Bean, Square Podded Pea, Square Podded Crimson Pea, *Botor tetragonoloba*, *Dolichos*-, or *Lotus tetragonolobus*, Pois Carré, Kecipir or Ketjeper, Calamismis or Kalamismis). 478, 591, 595, 886, 1432, 1534, 1659, 1660, 1745, 1837

Worcestershire Sauce (Soy Sauce Was the Main Ingredient before the 1940s). Including Lea & Perrins. 50, 86, 98, 140, 155, 284, 679, 852, 1651

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Yamasa Corporation (Choshi, Japan; and Salem, Oregon). 13, 24, 50, 167, 1585, 1918

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Yuba (The Film That Forms Atop Soymilk When It Is Heated). In Chinese (Mandarin): Doufu Pi (“Tofu Skin”) or Doufu Yi (“Tofu Robes,” pinyin), Toufu P’i or Toufu I (Wade-Giles). English-Language Chinese Cookbooks and Restaurants: “Bean Curd Skin”. 12, 14, 22, 25, 26, 28, 29, 30, 37, 39, 43, 44, 46, 48, 49, 52, 53, 54, 57, 58, 59, 60, 65, 67, 69, 73, 77, 81, 87, 89, 91, 94, 95, 96, 98, 108, 119, 127, 129, 132, 137, 140, 152, 154, 167, 173, 180, 182, 184, 189, 192, 197, 201, 217, 222, 230, 243, 259, 284, 300, 324, 328, 362, 374, 383, 388, 396, 406, 408, 479, 488, 489, 490, 491, 508, 509, 513, 540, 542, 553, 576, 577, 591, 595, 597, 606, 607, 611, 612, 644, 649, 650, 652, 653, 661, 673, 692, 695, 698, 699, 703, 754, 771, 772, 777, 778, 782, 790, 805, 829, 830, 833, 846, 852, 858, 866, 869, 875, 884, 903, 905, 906, 927, 933, 941, 961, 973, 980, 999, 1000, 1007, 1020, 1027, 1035, 1041, 1046, 1064, 1068, 1078, 1085, 1093, 1153, 1189, 1218, 1224, 1249, 1269, 1279, 1301, 1303, 1305, 1311, 1349, 1382, 1384, 1402, 1412, 1454, 1490, 1504, 1505, 1513, 1519, 1521, 1537, 1549, 1550, 1561, 1562, 1565, 1570, 1586, 1590, 1591, 1601, 1607, 1625, 1641, 1642, 1647, 1659, 1660, 1667, 1668, 1669, 1674, 1708, 1712, 1713, 1750, 1757, 1769, 1789, 1806, 1816, 1837, 1843, 1861, 1866, 1904, 1926

Yuba–Dried Yuba Sticks or Rolls, and Sweet Dried Yuba–Chinese-Style. In Chinese (Mandarin): Fuzhu (pinyin; zhu = “bamboo”). Fu Chu (Wade-Giles). In Cantonese Chinese Foo Jook / Fu Jook / Joke or Tiem Jook / Tim Jook / Tiem Joke. Also: Bean Curd Sticks, Bean Curd Bamboo. 119, 259, 852, 1062, 1642, 1725, 1926

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